ENG.20050308.0004

BECHTEL SAIC COMPANY LLC

QA: QA

000-30R-MGR0-00400-000-001

March 2005

Nuclear Safety Design Bases for License Application

Prepared for:
U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Office of Repository Development
1551 Hillshire Drive
Las Vegas, Nevada 89134-6321

Prepared by:
Bechtel SAIC Company, LLC
1180 Town Center Drive
Las Vegas, Nevada 89144

Under Contract Number
DE-AC28-01RW12101

DISCLAIMER

Originator:

SIGNATURE ON FILE

R. J. Garrett
Preclosure Safety Engineer

03/08/05
Date

Checker:

SIGNATURE ON FILE

D. T. Dexheimer
Preclosure Safety Engineer

3/8/05
Date

Quality Engineering Representative:

SIGNATURE ON FILE

J. F. Lacret
Quality Assurance Engineer

3/08/2005
Date

Responsible Manager:

SIGNATURE ON FILE

D. C. Richardson
Manager, Preclosure Safety Analysis

3/08/2005
Date

INTENTIONALLY LEFT BLANK

CHANGE HISTORY

Revision Number	Interim Change No.	Effective Date	Description of Change
00	N/A	N/A	Initial issue as 000-30R-MGR0-00400-000-000. This initial issue supersedes TDR-MGR-RL-000006. The document identifier was changed to conform to the document numbering methodology for engineering documents. This document is a complete revision of TDR-MGR-RL-000006.
01	N/A	N/A	Complete revision to incorporate design changes to the existing repository design. These design changes resulted in additions and deletions to the list of structures, systems, and components classified as important to safety. These structures, systems, and components that are important to safety require nuclear safety design bases or changes to the existing design bases.

INTENTIONALLY LEFT BLANK

CONTENTS

Page

CONTENTS (Continued)

Page

TABLES

Page

INTENTIONALLY LEFT BLANK

ACRONYMS

CHF	Canister Handling Facility
DOE	U.S. Department of Energy
DTF	Dry Transfer Facility
FHF	Fuel Handling Facility
HEPA	high-efficiency particulate air
HLW	high-level radioactive waste
HVAC	heating, ventilation, and air-conditioning
ITS	important to safety
ITWI	important to waste isolation
MCO	multicanister overpack
MSC	monitored geologic repository site-specific cask
SC	safety category
SNF	spent nuclear fuel
SSC	structure, system, or component
SSCs	structures, systems, and components
TCRRF	Transportation Cask Receipt and Return Facility
WNNRF	Warehouse and Non-Nuclear Receipt Facility
WP	waste package

INTENTIONALLY LEFT BLANK

1. PURPOSE

The purpose of this report is to identify and document the nuclear safety design requirements that are specific to structures, systems, and components (SSCs) of the repository that are important to safety (ITS) during the preclosure period and to support the preclosure safety analysis and the license application for the high-level radioactive waste (HLW) repository at Yucca Mountain, Nevada. The scope of this report includes the assignment of nuclear safety design requirements to SSCs that are ITS and does not include the assignment of design requirements to SSCs or natural or engineered barriers that are important to waste isolation (ITWI).

These requirements are used as input for the design of the SSCs that are ITS such that the preclosure performance objectives of 10 CFR 63.111 [DIRS 156605] are met. The natural or engineered barriers that are important to meeting the postclosure performance objectives of 10 CFR 63.113 [DIRS 156605] are identified as ITWI. Although a structure, system, or component (SSC) that is ITS may also be ITWI, this report is only concerned with providing the nuclear safety requirements for SSCs that are ITS to prevent or mitigate event sequences during the repository preclosure period.

2. QUALITY ASSURANCE

As established using information presented in Section 2 of *Quality Assurance Requirements and Description* (DOE 2004 [DIRS 171539]), this report is subject to quality assurance program requirements because the design bases that are identified are applicable to items classified as ITS as defined by 10 CFR 63.2 [DIRS 156605]. This report was developed in accordance with procedures LP-3.11Q-BSC, *Technical Reports* and AP-3.13Q, *Design Control*. Input data are identified and tracked in accordance with LP-3.15Q-BSC, *Managing Technical Product Inputs*.

3. USE OF SOFTWARE

No software required to be qualified under LP-SI.11Q-BSC, *Software Management*, was used for any part of this analysis. The text of this report is printed using Microsoft Word and is exempted from the requirements of LP-SI.11Q-BSC per Section 2.1.1 of the procedure.

4. DESIGN INPUTS

4.1 TECHNICAL INFORMATION

4.1.1. In this analysis the acronym for the Dry Transfer Facility (DTF) represents both DTF 1 and DTF 2 and implies that the same systems and components are located within both DTF 1 and DTF 2. Basis: Two identical DTFs are planned. Initially, only one will be constructed and operated. Throughput requirements will determine the timing of construction and operation of the second DTF (BSC 2004e [DIRS 167232], Section 1.1).

4.1.2 *Safety Classification of SSCs and Barriers* (BSC 2005a [DIRS 171668], Table A-1) establishes the safety classification of the SSCs that are ITS. Basis: This input is appropriate for use because it represents the latest safety classification information available for this report.

4.1.3 *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7) establishes the categorization (as Category 1, Category 2, or Beyond Category 2) of the internal and external event sequences that may occur before permanent closure of the repository at Yucca Mountain. Basis: This input is appropriate for use because it represents the latest event sequence categorization information available for this report.

4.1.4 *Preclosure Consequence Analyses for License Application* (BSC 2005c [DIRS 171607], Section 7) describes the SSCs relied upon for prevention or mitigation of identified event sequences. Basis: This input is appropriate for use because it provides the consequences of potential event sequences and identifies the SSCs required to mitigate the consequences of event sequences in order to comply with the performance objectives of 10 CFR Part 63 [DIRS 156605].

4.1.5 *Fire-Induced Event Sequence Analysis* (BSC 2004c [DIRS 171488], Section 5) describes the SSCs relied upon for prevention or mitigation of identified fire-induced event sequences. Basis: This input is appropriate for use because it provides the basis for design requirements that are required to mitigate the consequences of fire-induced event sequences in order to comply with the performance objectives of 10 CFR Part 63 [DIRS 156605].

4.1.6 *Extreme Wind/Tornado/Tornado Missile Hazard Analysis* (BSC 2004d [DIRS 171471], Section 9) describes the SSCs relied upon for prevention or mitigation of identified event sequences. Basis: This input is appropriate for use because it provides the basis for design requirements that are required to mitigate the consequences of event sequences associated with extreme winds, tornadoes, and tornado missile hazards in order to comply with the performance objectives of 10 CFR Part 63 [DIRS 156605].

4.1.7 *Monitored Geologic Repository External Events Hazards Screening Analysis* (BSC 2004b [DIRS 167266], Section 6) describes the SSCs relied upon for prevention or mitigation of identified event sequences. Basis: This input is appropriate for use because it provides the basis for design requirements that are required to mitigate the consequences of event sequences associated with external events in order to comply with the performance objectives of 10 CFR Part 63 [DIRS 156605].

4.1.8 *Frequency Analysis of Aircraft Hazards for License Application* (BSC 2005d [DIRS 171786], Section 5) describes the SSCs relied upon for prevention or mitigation of identified event sequences. Basis: This input is appropriate for use because it provides the basis for the design requirements associated with aircraft hazards that are required to prevent or mitigate the consequences of event sequences associated with aircraft hazards in order to comply with the performance objectives of 10 CFR Part 63 [DIRS 156605].

4.1.9 *Reliability Analysis of the Electrical Power Distribution System to Selected Portions of the Nuclear HVAC System* (BSC 2004f [DIRS 171490], Table 9) describes the SSCs relied upon for prevention or mitigation of identified event sequences. Basis: This input is appropriate for use because it provides the basis for the design requirements that are required to prevent or mitigate the consequences of event sequences associated with the electrical power system in order to comply with the performance objectives of 10 CFR Part 63 [DIRS 156605].

4.1.10 *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Section 4) describes the functions of SSCs relied upon for prevention or mitigation of identified event sequences. Basis: This input is appropriate for use because it provides the basis for the design requirements that are required to prevent or mitigate the consequences of event sequences associated with seismic events in order to comply with the performance objectives of 10 CFR Part 63 [DIRS 156605].

4.1.11 *SNF Aging System Safety Study* (Cogema. 2004 [DIRS 171793], Section 6) describes the functions of SSCs relied upon for prevention or mitigation of identified event sequences. Basis: This input is appropriate for use because it provides the basis for the design requirements that are required to prevent or mitigate the consequences of event sequences associated with the SNF Aging System in order to comply with the performance objectives of 10 CFR Part 63 [DIRS 156605].

4.2 CRITERIA

Federal Regulations

The safety classification criteria used in this report are based on the performance objectives stated in 10 CFR 63.111 [DIRS 156605]. Transportation casks received at the repository comply with requirements of 10 CFR 71.55 [DIRS 104091], which states that casks are to be subcritical even with most reactive credible configuration of fissile material and moderation to the most reactive credible extent, and the design bases of 10 CFR 71.73 [DIRS 104091]. Event sequence categorization methodology is based on the 10 CFR 63.2 definition of event sequence.

5. ASSUMPTIONS

5.1 System architecture is established by “Facility, Equipment and System Names for Use in the SAR” (Lucas 2004 [DIRS 170073]). Rationale: This input is appropriate for use because it represents the latest design information and system architecture available for this report.

5.2 Although the Remediation Facility is included in the system architecture provided in Lucas (2004 [DIRS 170073]), it is assumed to be included as an integral part of the DTF and will not exist as a separate facility. Rationale: The Remediation Facility is integrated within the DTF and provides the space, layout, structures, and embedded systems needed to recover from off-normal conditions during waste-handling operations (e.g., a damaged transportation cask, fuel form, or waste package [WP]).

6. ANALYSIS

6.1 METHOD

A distinction is made between the repository design bases and the 10 CFR 63.2 [DIRS 156605] design bases for SSCs that are ITS. All SSCs have design bases; however, only SSCs that are ITS have design bases as defined by 10 CFR 63.2. These 10 CFR 63.2 design bases are required, pursuant to 10 CFR 63.112 [DIRS 156605], to be included in the preclosure safety analysis of the license application for a repository at Yucca Mountain.

The preclosure safety analysis of the license application provides a safety assessment of the 10 CFR 63.2 repository design bases. The 10 CFR 63.2 design bases and the supporting design information are subjected to design control and the other quality assurance criteria of 10 CFR 63.142 [DIRS 156605].

The methodology for developing the 10 CFR 63.2 design bases are summarized in the following paragraphs.

The Category 1, Category 2, and Beyond Category 2 event sequences derived from the internal, external, and other applicable hazards analyses (such as fire hazards analysis, aircraft crash hazards analysis, etc.) are identified. The list of Category 1, Category 2, and Beyond Category 2 event sequences form a part of the repository licensing bases and appear in the license application. Each Category 1, Category 2, and Beyond Category 2 event sequence involves SSCs that are evaluated within the preclosure safety analysis to assess the likelihood and consequences of an event sequence leading to a dose that exceeds the 10 CFR Part 63 [DIRS 156605] preclosure performance objectives. These SSCs may change as the design matures. Changes in the list of event sequences result in a reassessment of affected SSCs and associated 10 CFR 63.2 design bases. Design iterations, design improvements, or design modifications could potentially lead to changes in the list of event sequences and associated SSCs throughout the licensing process and beyond.

Compliance with the 10 CFR Part 63 performance objectives for Category 1 and Category 2 event sequences is significantly different for each category. Category 1 event sequence compliance assessments are based on annual performance requirements that require an aggregation of releases. A Category 2 event sequence compliance assessment is made on a per-event basis. No aggregation of releases is made for Category 2 event sequences. Because of these compliance differences, the design bases for SSCs that are ITS involved in Category 2 event sequences are developed before the design bases associated with the Category 1 event sequences. ITS SSCs may be required to ensure that an event sequence is categorized as Beyond Category 2.

The set of SSCs that has been classified as ITS based on the Category 1 and Category 2 event sequences is identified. In addition, those SSCs credited for ensuring that an event sequence is categorized as Beyond Category 2 are identified. These SSCs that have been classified as ITS require 10 CFR 63.2 design bases to be established.

A single SSC is then chosen from the set of SSCs classified as ITS and the Category 1, Category 2, and Beyond Category 2 event sequences that credit the function of that SSC are identified from the applicable supporting analyses.

For the selected SSC that is ITS, the Category 2 and Beyond Category 2 10 CFR 63.2 design bases are developed. This selection process is repeated until the SSCs that are ITS have 10 CFR 63.2 design bases developed for each of the Category 2 and Beyond Category 2 event sequences.

After the design bases for the Category 2 and Beyond Category 2 event sequences are identified, an SSC that is ITS for meeting the Category 1 performance objective is selected. The 10 CFR 63.2 design bases for the SSC that is ITS that meet the 10 CFR Part 63 preclosure performance objectives for Category 1 event sequences are then selected. This process is repeated until 10 CFR 63.2 design bases are established for the SSCs that are ITS in the Category 1 event sequences.

6.2 ARCHITECTURE

The repository is comprised of the following facilities (Lucas 2004 [DIRS 170073]):

1. Balance of Plant Facility
2. Canister Handling Facility (CHF)
3. DTF
4. Fuel Handling Facility (FHF)
5. Subsurface Facility
6. Transportation Cask Receipt and Return Facility (TCRRF)
7. Warehouse and Non-Nuclear Receipt Facility (WNNRF).

Although the Remediation Facility is included in the system architecture provided in “Facility, Equipment and System Names for Use in the SAR” (Lucas 2004 [DIRS 170073]), it has since been included as an integral part of the DTF and does not exist as a separate facility (Assumption 5.2).

Repository systems are subdivided into process systems and infrastructure systems. Process systems include systems that involve primary processes in the waste handling and waste isolation systems while the infrastructure systems are those systems that are needed to provide support to the process systems and the facilities. Process and infrastructure systems exist and operate in multiple facilities.

The repository waste handling systems are evaluated to determine the applicability of Category 1, Category 2, and Beyond Category 2 event sequences associated with preclosure operations (BSC 2005b [DIRS 171429]). The Balance of Plant facilities have no Category 1, Category 2, or Beyond Category 2 event sequences associated with preclosure operations (BSC 2005b [DIRS 171429]). The remaining repository facilities and the repository process systems that are present in these facilities include the following (Lucas 2004 [DIRS 170073]):

- Transportation Cask Receipt/Return Facility
  - Cask Receipt/Return System

- Warehouse and Non-Nuclear Receipt Facility
  - DOE and Commercial Waste Package System
  - Naval Spent Nuclear Fuel Waste Package System
  - Non-Nuclear Handling System

- Dry Transfer Facility
  - DOE and Commercial Waste Package System
  - Naval Spent Nuclear Fuel Waste Package System
  - Cask Receipt/Return System
  - Non-Nuclear Handling System
  - Cask/MSC/WP Preparation System
  - SNF/HLW Transfer System
  - Waste Package Closure System
  - Remediation System
  - Emplacement and Retrieval System
  - SNF Aging System

- Canister Handling Facility
  - DOE and Commercial Waste Package System
  - Naval Spent Nuclear Fuel Waste Package System
  - Cask Receipt/Return System
  - Non-Nuclear Handling System
  - Cask/MSC/WP Preparation System
  - SNF/HLW Transfer System
  - Waste Package Closure System
  - Emplacement and Retrieval System
  - SNF Aging System

- Fuel Handling Facility
  - DOE and Commercial Waste Package System
  - Naval Spent Nuclear Fuel Waste Package System
  - Cask Receipt/Return System
  - Non-Nuclear Handling System
  - Cask/MSC/WP Preparation System
  - SNF/HLW Transfer System
  - Waste Package Closure System
  - Emplacement and Retrieval System
  - SNF Aging System

- Subsurface Facility
  - DOE and Commercial Waste Package System
  - Naval Spent Nuclear Fuel Waste Package System
  - Emplacement and Retrieval System
  - SNF Aging System

The applicable repository facility and process system SSCs provided in this report are presented with their corresponding 10 CFR 63.2 design bases.

6.3 CATEGORIZATION OF EVENT SEQUENCES

An event sequence is defined by the U.S. Nuclear Regulatory Commission to be “a series of actions and/or occurrences within the natural and engineered components of a geologic repository operations area that could potentially lead to exposure of individuals to radiation” (10 CFR 63.2). Event sequences that are “expected to occur one or more times before permanent closure of the geologic repository operations area are referred to as Category 1 event sequences” (10 CFR 63.2). “Other event sequences that have at least one chance in 10,000 of occurring before permanent closure are referred to as Category 2 event sequences” (10 CFR 63.2). Less likely event sequences are considered Beyond Category 2. An event that has no potential for “exposure of individuals to radiation” is not considered an event sequence.

The initial step of the process for determining the 10 CFR Part 63.2 design bases involves determining the Category 1, Category 2, and Beyond Category 2 event sequences. These event sequences are identified in the internal, external, and other applicable hazards analyses. *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429]) establishes the categorization (as Category 1, Category 2, or Beyond Category 2) of the internal and external event sequences that may occur before permanent closure of the repository at Yucca Mountain.

6.4 CLASSIFICATION OF STRUCTURES, SYSTEMS, AND COMPONENTS

Safety Classification of SSCs and Barriers (BSC 2005a [DIRS 171668]) establishes the safety classification of the repository SSCs. If an SSC is determined to be ITS or ITWI, then it is classified as safety category (SC). An SSC can be ITS, ITWI, both, or neither. If an SSC is neither ITS nor ITWI, it is classified as Non-SC. The safety classifications of the repository SSCs, as established in *Safety Classification of SSCs and Barriers* (BSC 2005a [DIRS 171668]), are reproduced in the tables found in Appendix A of this analysis. The set of SSCs that have been classified as ITS based on the Category 1 and Category 2 event sequences, as well as those SSCs credited for ensuring that an event sequence is categorized as Beyond Category 2, are identified.

6.5 EVENT SEQUENCE CONSEQUENCE ANALYSIS

The worker and offsite radiation doses were calculated in *Preclosure Consequence Analyses for License Application* (BSC 2005c [DIRS 171607], Section 7) for the event sequences identified in *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7). In addition, any mitigative functions performed by ITS SSCs that are credited in the dose calculations are identified (such as high-efficiency particulate air [HEPA] filters).

6.6 DEVELOPMENT OF DESIGN BASES

The development of the 10 CFR 63.2 design bases follows the methodology described in Section 6.1 using the inputs described in Section 4.1.

The repository facilities, and the repository process systems that are present in these facilities, are listed in the following subsections based on the repository architecture described in Section 6.2. The facilities and systems that have Category 1 or Category 2 event sequences that require SSCs to perform prevention or mitigation functions are identified. In some instances, 10 CFR 63.2 design bases are developed for SSCs that provide prevention functions to ensure that the frequency of an event sequence is Beyond Category 2.

The 10 CFR 63.2 design bases (the nuclear safety design bases) for the repository facilities, systems, subsystems, and selected SSCs that are developed using the methodology described in Section 6.1 are presented in Tables A-I and A-II of Appendix A.

6.6.1 Waste Handling Area Facilities

The repository facilities include the following: the Balance of Plant Facility, CHF, DTF, FHF, Subsurface Facility, TCRRF, and the WNNRF (Lucas 2004 [DIRS 170073]). The safety categories for these facilities are shown in Attachment A of *Safety Classification of SSCs and Barriers* (BSC 2005a [DIRS 171668]).

6.6.1.1 Balance of Plant Facility

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in the facilities that comprise the Balance of Plant Facility to perform prevention or mitigation functions. The switchgear facility contains portions of the electrical power system that are ITS. Although the structure contains ITS components, there are no event sequences identified that prevent the ITS components from performing their ITS function. No Balance of Plant facility is required to function to protect an ITS or ITWI SSC or natural or engineered barrier. The safety category of the system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Balance of Plant Facility.

6.6.1.2 Canister Handling Facility

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are Category 2 event sequences that could occur in this facility and there are features of the facility that are ITS for prevention or mitigation of event sequences. The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This facility contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this facility is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-I in Appendix A presents the nuclear safety design bases associated with the CHF.

6.6.1.3 Dry Transfer Facility

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7) and *Preclosure Consequence Analysis for License Application* (BSC 2005c [DIRS 171607], Section 7), there are Category 1 and Category 2 event sequences that could occur in this facility and there are features of the facility that are ITS for prevention or mitigation of event sequences. *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This facility contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this facility is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-I in Appendix A presents the nuclear safety design bases associated with the DTF.

6.6.1.4 Fuel Handling Facility

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7) and the *Preclosure Consequence Analysis for License Application* (BSC 2005c [DIRS 171607], Section 7), there are Category 1 and Category 2 event sequences that could occur in this facility and there are features of the facility that are ITS for prevention or mitigation of event sequences. The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This facility contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this facility is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-I in Appendix A presents the nuclear safety design bases associated with the FHF.

6.6.1.5 Subsurface Facility

The Subsurface Facility consists of the emplacement drifts, subsurface development, and postemplacement subsystems (BSC 2005a [DIRS 171668], Section 6.3.1.5). In this report, the Subsurface Facility and its three component subsystems are considered separately in the development of nuclear safety design bases.

The size and layout of the emplacement drifts component of the Subsurface Facility ensure that performance complies with rockfall modeling (preclosure and postclosure) and drift modeling (postclosure) because they provide the rock properties and emplacement drifts layout and dimensions for the rockfall analysis. The size and layout of drifts is both ITS and ITWI. Nonemplacement openings of the Subsurface Facility provide the size properties consistent with rockfall modeling for preclosure. A change of the size of the nonemplacement openings may allow a larger rockfall that could breach WPs as they are transported through the openings. Thus, the nonemplacement openings component is ITS. The safety category of the Subsurface Facility is SC (BSC 2005a [DIRS 171668], Attachment A).

The emplacement drifts excavated openings component of the emplacement drift subsystem are ITS and ITWI because they provide the rock properties and emplacement drift layout dimensions for the rockfall analyses used in preclosure safety analyses and postclosure performance confirmation (BSC 2005a [DIRS 171668], Attachment A). The WP emplacement pallet component of the emplacement drift subsystem is ITS and ITWI for providing structural support to protect the WP from damage during surface handling operations and transport to, and into, an emplacement drift. During the preclosure and postclosure periods, the WP emplacement pallet provides support to the WP should a seismic event occur. The safety category of the emplacement drift subsystem is SC (BSC 2005a [DIRS 171668], Attachment A). There is no Category 1 or Category 2 event sequence that requires SSCs in the emplacement drift subsystem to perform prevention or mitigation functions (BSC 2005b [DIRS 171429], Section 7). The

Seismic Analysis for Preclosure Safety (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences.

The postemplacement subsystem and its closure functions during postclosure are ITWI. This subsystem does not include ITS SSCs; it does include ITWI SSCs. The safety category of this subsystem is SC (BSC 2005a [DIRS 171668], Attachment A). There is no Category 1 or Category 2 event sequence that requires SSCs in the postemplacement subsystem to perform preclosure prevention or mitigation functions (BSC 2005b [DIRS 171429], Section 7).

The subsurface development subsystem does not contain spent nuclear fuel (SNF) or HLW. There is no Category 1 or Category 2 event sequence that requires SSCs in this subsystem to perform prevention or mitigation functions (BSC 2005b [DIRS 171429], Section 7). Therefore, this subsystem does not include ITS SSCs or ITWI SSCs or natural or engineered barriers. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A).

The nuclear safety design bases associated with the Subsurface Facility and its subsystems are presented in Table A-I in Appendix A.

6.6.1.6 Transportation Cask Receipt/Return Facility

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), Category 2 event sequences could occur in the TCRRF and there are features of the facility that are ITS for prevention or mitigation of event sequences. The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This facility contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this facility is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-I in Appendix A presents the nuclear safety design bases associated with the TCRRF.

6.6.1.7 Warehouse and Non-Nuclear Receipt Facility

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in the WNNRF to perform prevention or mitigation functions. Therefore, this facility consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this facility is Non-SC (BSC 2005a [DIRS 171668], Attachment A).

6.6.2 Waste Process and Infrastructure Systems

6.6.2.1 Cask/MSC/WP Preparation System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are Category 2 event sequences that could occur in this system and there are features of the system that are ITS for prevention or mitigation of event sequences. The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This system contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this system is SC (BSC 2005a [DIRS 171668] Attachment A).

Table A-II in Appendix A presents the nuclear safety design bases associated with the Cask/MSC/WP Preparation System.

6.6.2.2 Cask Receipt and Return System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are Category 2 event sequences that could occur in this system and there are features of the system that are ITS for prevention or mitigation of event sequences. This system consists of SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the Cask Receipt and Return System.

6.6.2.3 Communications System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Communications System.

6.6.2.4 Digital Control and Management Information System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Digital Control and Management Information System.

6.6.2.5 DOE and Commercial Waste Package System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), a Category 2 event sequence that requires the WP to perform prevention or mitigation functions could occur (BSC 2005b [DIRS 171429], Section 5.1.3). The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. The WP functions during the preclosure and postclosure periods result in the WP being identified as ITS and ITWI, respectively (BSC 2005a [DIRS 171668], Section 6.3.2.5). The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the DOE and Commercial Waste Package System.

6.6.2.6 Electrical Power System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7]), there are Category 1 or Category 2 event sequences that require a function or functions of the surface nuclear heating, ventilation, and air-conditioning (HVAC) system for mitigation of Category 1 event sequences (BSC 2005b [DIRS 171429], Section 7). The switchyard, normal power, and emergency power subsystems are required for operation and support of the surface nuclear HVAC system in the DTF and FHF to maintain doses within the performance objectives of 10 CFR 63.111 [DIRS 156605]. The electrical power system supports the availability of the switchyard, normal power, and emergency power to mitigate the consequences of an event sequence. It includes ITS SSCs; it does not include ITWI SSCs or natural or engineered barriers. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the Electrical Power System.

6.6.2.7 Electrical Support System

As described in *Safety Classification of SSCs and Barriers* (BSC 2005a [DIRS 171668], Section 6.3.2.7), this system provides electrical support for construction and operation of the surface and subsurface facilities, including ITS functions of the surface nuclear HVAC system. Portions of the cable raceway subsystem that support the availability of electrical power to mitigate the consequences of an event sequence are ITS. SSCs in the remaining portions of the electrical support system do not prevent or mitigate the consequences of a Category 1 or Category 2 event sequence. This system includes ITS SSCs; it does not include ITWI SSCs or natural or engineered barriers. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the Electrical Support System.

6.6.2.8 Emplacement and Retrieval System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are Category 2 event sequences that could occur in this system and there are features of the system that are ITS for prevention or mitigation of event sequences. The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This system contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the Emplacement and Retrieval System.

6.6.2.9 Environmental/Meteorological Monitoring System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Environmental/Meteorological Monitoring System.

6.6.2.10 Fire Protection System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Fire Protection System.

6.6.2.11 HVAC Plant Heating and Cooling System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the HVAC Plant Heating and Cooling System.

6.6.2.12 Low-Level Radioactive Waste Generating System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429] Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Low-Level Radioactive Waste Generating System.

6.6.2.13 Low-Level Radioactive Waste Management System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Low-Level Radioactive Waste Management System.

6.6.2.14 Naval Spent Nuclear Fuel Waste Package System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), a Category 2 event sequence that requires the WP to perform prevention or mitigation functions could occur (BSC 2005b, Section 5.1.3). The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. The WP functions during the preclosure and postclosure periods result in the WP being identified as ITS and ITWI, respectively (BSC 2005a [DIRS 171668], Section 6.3.2.14). The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the Naval Spent Nuclear Fuel Waste Package System.

6.6.2.15 Non-Nuclear Handling System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Non-Nuclear Handling System.

6.6.2.16 Non-Radiological Waste Management System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Non-Radiological Waste Management System.

6.6.2.17 Plant Services System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Plant Services System.

6.6.2.18 Radiation/Radiological Monitoring System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Radiation/Radiological Monitoring System.

6.6.2.19 Remediation System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), a Category 2 event sequence could occur in this system and there are features of the system that are ITS for prevention or mitigation of event sequences. The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This system contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the Remediation System.

6.6.2.20 Safeguards and Security System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Safeguards and Security System.

6.6.2.21 SNF Aging System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), a Category 2 event sequence could occur in this system and there are features of the system that are ITS for prevention or mitigation of event sequences. The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This system contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the SNF Aging System.

6.6.2.22 SNF/HLW Transfer System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7) and *Preclosure Consequence Analyses for License Application* (BSC 2005c [DIRS 171607], Section 7), there are Category 1 and Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. As established by *Preclosure Consequence Analyses for License Application* (BSC 2005c [DIRS 171607], Section 7), the worker radiation doses and offsite radiation doses for Category 1 and Category 2 event sequences meet the 10 CFR Part 63 [DIRS 156605] performance objectives. This system contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the SNF/HLW Transfer System.

6.6.2.23 Subsurface Ventilation System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Subsurface Ventilation System.

6.6.2.24 Surface Industrial HVAC System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 5.1.2.4) there are Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system includes SSCs that are ITS; it does not include ITWI SSCs or natural or engineered barriers. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the Surface Industrial HVAC System.

6.6.2.25 Surface Nuclear HVAC System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7) and the *Preclosure Consequence Analysis for License Application* (BSC 2005c [DIRS 171607]), there are Category 1 event sequences that require SSCs in this system to perform prevention or mitigation functions. The *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Attachment III) has identified potential seismically initiated failures that could lead to undesired consequences. This system contains SSCs that are ITS; it does not contain SSCs or natural or engineered barriers that are ITWI. The safety category of this system is SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with the Surface Nuclear HVAC System.

6.6.2.26 Waste Package Closure System

As established by *Categorization of Event Sequences for License Application* (BSC 2005b [DIRS 171429], Section 7), there are no Category 1 or Category 2 event sequences that require SSCs in this system to perform prevention or mitigation functions. Therefore, this system consists of no SSCs that are ITS or SSCs or natural or engineered barriers that are ITWI. The safety category of this system is Non-SC (BSC 2005a [DIRS 171668], Attachment A). There are no nuclear safety design bases associated with the Waste Package Closure System.

6.7 OTHER ITEMS IMPORTANT TO SAFETY

The transportation casks, standardized U.S. Department of Energy (DOE) SNF disposable canisters, DOE HLW canisters, DOE multicanister overpacks (MCOs), the naval SNF canisters, and the dual-purpose canisters (DPCs) are ITS, but are not a part of the repository architecture (Lucas 2004 [DIRS 170073]). In the *Categorization of Event Sequences for License Application* analysis (BSC 2005b [DIRS 171429], Section 7) it was established that a breach of a transportation cask with impact limiters installed is a Beyond Category 2 event sequence based on the 10 CFR 71.55 [DIRS 104091] and 10 CFR 71.73 [DIRS 104091] design requirements for the transportation casks (BSC 2005b [DIRS 171429], Section 7). A breach of a DOE MCO or a standardized DOE SNF canister is a Beyond Category 2 event sequence based on the acceptance requirements of the *Waste Acceptance System Requirements Document* (DOE 2002 [DIRS 158873], Section 4.3.7). A breach of the DOE HLW canister, naval SNF canister, or DPC as a result of a credible fire is a Beyond Category 2 event sequence (BSC 2004c [DIRS 171488], Section 5).

To ensure that transportation casks with impact limiters installed and that standardized DOE SNF canisters are capable of withstanding drops within the design basis without breach, they have been designated as ITS and classified as SC (BSC 2005a [DIRS 171668], Attachment A). Table A-II in Appendix A presents the nuclear safety design bases associated with transportation casks, DOE HLW canisters, DOE MCOs, naval SNF canisters, standardized DOE SNF canisters, and DPCs.

7. CONCLUSIONS

The 10 CFR 63.2 design bases (nuclear safety design bases) selected in this report using the methodology presented in Section 6.1 are listed in Appendix A. These nuclear safety design bases are used as input to the design of the repository. These output results are reasonable compared to the input and are suitable for their intended use. As the design of the repository proceeds and further event sequences and consequence analyses of hazards are performed, this report will be reviewed for impact and revised as necessary.

8. REFERENCES

8.1 DOCUMENTS CITED

[DIRS 171470]
BSC (Bechtel SAIC Company) 2004a. *Seismic Analysis for Preclosure Safety.* 000-00C-MGR0-00700-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20041216.0031.

[DIRS 167266]
BSC 2004b. *Monitored Geologic Repository External Events Hazards Screening Analysis.* 000-00C-MGR0-00500-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20040712.0004.

[DIRS 171488]
BSC 2004c. *Fire-Induced Event Sequence Analysis.* 000-00C-MGR0-01300-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20041208.0001.

[DIRS 171471]
BSC 2004d. *Extreme Wind/Tornado/Tornado Missile Hazard Analysis.* 000-00C-WHS0-00100-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20041105.0001.

[DIRS 167232]
BSC 2004e. *Dry Transfer Facility Description Document.* 110-3YD-CD00-00100-000-000. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20040712.0002.

[DIRS 171490]
BSC 2004f. *Reliability Analysis of the Electrical Power Distribution System to Selected Portions of the Nuclear HVAC System.* 100-PSA-EE00-00100-000-00A. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20041216.0029.

[DIRS 171599]
BSC 2004g. *Project Design Criteria Document.* 000-3DR-MGR0-00100-000-003. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20041124.0001.

[DIRS 171668]
BSC 2005a. *Safety Classification of SSCs and Barriers.* 000-00C-MGR0-01000-000-001. Las Vegas, Nevada: Bechtel SAIC Company. ENG.20050215.0007.

[DIRS 171429]
BSC 2005b. *Categorization of Event Sequences for License Application.* 000-00C-MGR0-00800-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: MOL.20050301.0445.

[DIRS 171607]
BSC 2005c. *Preclosure Consequence Analyses for License Application.* 000-00C-MGR0-00900-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20050112.0003.

[DIRS 171786]
BSC 2005d. *Frequency Analysis of Aircraft Hazards for License Application.* 000-00C-WHS0-00200-000-00B. Las Vegas, Nevada: Bechtel SAIC Company. ACC: ENG.20050214.0009.

[DIRS 171793]
Cogema 2004. *SNF Aging System Safety Study*. COGEMA-C0115-RP-04-005, Rev. 1. Las Vegas, Nevada: Cogema. ACC: ENG.20040917.0002.

[DIRS 158873]
DOE (U.S. Department of Energy) 2002. *Waste Acceptance System Requirements Document.* DOE/RW-0351, Rev. 4. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: MOL.20020326.0056.

[DIRS 171539]
DOE 2004. *Quality Assurance Requirements and Description.* DOE/RW-0333P, Rev. 16. Washington, D.C.: U.S. Department of Energy, Office of Civilian Radioactive Waste Management. ACC: DOC.20040907.0002.

[DIRS 170073]
Lucas, L. 2004. "Facility, Equipment and System Names for Use in the SAR." Interoffice memorandum from L. Lucas (BSC) to M.R. Bryan, June 24, 2004, 0521041674. ACC: MOL.20040625.0028.

8.2 CODES, STANDARDS, AND REGULATIONS

[DIRS 156605]
10 CFR 63. Energy: Disposal of High-Level Radioactive Wastes in a Geologic Repository at Yucca Mountain, Nevada. Readily available.

[DIRS 104091]
10 CFR 71. Energy: Packaging and Transportation of Radioactive Material. Readily available.

8.3 PROCEDURES

AP-3.13Q, Rev. 3, ICN 3. *Design Control.* ACC: DOC.20040202.0006.

LP-3.11Q-BSC, Rev. 0, ICN 2. *Technical Reports.* ACC: DOC.20050215.0009.

LP-3.15Q-BSC, Rev. 0, ICN 0. *Managing Technical Product Inputs.* ACC: DOC.20050113.0002.

LP-SI.11Q-BSC, Rev. 0, ICN 1. *Software Management.* ACC: DOC.20040015.0008.

INTENTIONALLY LEFT BLANK

APPENDIX A

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Balance of Plant Facilities				
Administration, Security, Utility, Emergency Response, Offsite, Materials and Consumables, Fire Water, Maintenance and Repair, Generator, Switchgear, Construction Support, Central Control Center, and Transportation Facilities	Structure	N/A	Non-SC	Not applicable. None of the SSC functions associated with these facilities are credited for the prevention or mitigation of an event sequence.
Canister Handling Facility				
CHF	Structure	ITS	SC	• The structure shall: (1) be designed for the loads associated with a design basis extreme wind speed. (BSC 2004g Section 6.1.1.2 and BSC 2004d Section 9) (2) be designed for the loads associated with a design basis tornado maximum wind speed with a corresponding pressure drop and rate of pressure drop. (BSC 2004g Section 4.2.2.3.7 and BSC 2004d Section 9) (3) not allow the penetration of Spectrum II tornado missiles, except for the entrance and exit vestibules and the steel structures on top of the building. (BSC 2004d Sections 6.4.4.1.1 and 9) • The roof of the structure shall be designed for the loads associated with the maximum observed hourly precipitation event (with a 100-year return period). (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2)

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
CHF (continued)	Structure (continued)	ITS	SC	• Facilities that could be damaged by flooding shall be located above the probable maximum flood elevation or must be appropriately protected from the probable maximum flood. (BSC 2004g Section 6.1.2.1 and BSC 2005b Section 4.3.2) • The structure shall be designed such that storm water runoff from the maximum observed hourly precipitation event (with a 100-year return period) does not enter the structure. (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2) • The roof of the structure shall be designed for the loads associated with a volcanic ash fall. (BSC 2004b Section 6.4.53) • Flooding of areas of the structure where moderators are controlled shall be precluded by passive design features such as drains, flood control channels, curbs, elevated processing areas, and walls. (BSC 2005b Section 5.1.1.21) • The CHF structure shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, it shall be demonstrated that the CHF structure has sufficient seismic design margin to ensure that a “no structural collapse” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The exterior walls of the CHF shall not be penetrated or collapsed by an F-16 aircraft crashing into an exterior wall at the speed corresponding to the 95th percentile from a probability distribution estimated from historical F-16 crashes. (BSC 2005d Section 5.1.5) • Surfaces in the load paths through which WPs, standardized DOE SNF canisters, DOE MCOs, naval SNF canisters, DPCs, transportation casks, horizontal transfer casks, or site-specific casks are transferred by crane shall be kept free of structures, such as post and curbs, that could puncture a container in the event of a drop. (BSC 2005b Section 5.1.1.40) • The severity of potential fires shall not jeopardize the structural integrity of structures where SNF/HLW is present. (BSC 2004c Section 5.1.3.2) • Portions, parts, subparts, or subsystems of a non-ITS SSC, which upon failure could adversely interact with an ITS SSC and prevent its safety function from being performed, shall be classified as ITS or redesigned to eliminate the potential unacceptable interaction with the identified ITS SSC. For seismic interactions, portions, parts, subparts, or subsystems of an otherwise non-ITS SSC shall be classified as ITS and shall be designed to the same seismic DBGM as the ITS SSCs subjected to the potential unacceptable interaction, or the non-ITS SSC may be redesigned to eliminate the potential unacceptable interaction. (BSC 2005b Section 5.1.1.37)

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
CHF (continued)	Rails for Trolleys, WP Transporters, and SRTCs	ITS	SC	• The rails and rail anchorages within the structure shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, it shall be demonstrated that the rails and rail anchorages have sufficient seismic design margin to ensure that a “no derailment” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Permanent Shielding (including shield doors, shield view ports, and viewing windows)	ITS	SC	• The CHF permanent shielding (including shield doors, shield view ports, and viewing windows) shall be designed for loading conditions associated with a DBGM-1 seismic event to demonstrate sufficient seismic design margin to ensure that a “shielding integrity remains intact” safety function[3] is maintained. (BSC 2004a Table IV-1) • Closure of airlock doors, shield doors, or other applicable doors on a trolley, SRTC, WP transporter, or other conveyance shall not cause a tipover of the conveyance or cause the conveyance to drop its load. (BSC 2005b Section 5.1.1.13) • Radiation exposure to workers due to inadvertent actuation of doors or pit protective covers shall be precluded such that this is not a Category 1 event. (BSC 2005b Section 5.1.1.57)
Dry Transfer Facility				
DTF	Structure	ITS	SC	• The structure shall: (1) be designed for the loads associated with a design basis extreme wind speed. (BSC 2004g Section 6.1.1.2 and BSC 2004d Section 9) (2) be designed for the loads associated with a design basis tornado maximum wind speed with a corresponding pressure drop and rate of pressure drop. (BSC 2004g Section 4.2.2.3.7 and BSC 2004d Section 9) (3) not allow the penetration of Spectrum II tornado missiles, except for the entrance and exit vestibules and the steel structures on the DTF roof. (BSC 2004d Sections 6.4.4.1.1 and 9) • The roof of the structure shall be designed for the loads associated with the maximum observed hourly precipitation event (with a 100-year return period). (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2) • Facilities that could be damaged by flooding shall be located above the probable maximum flood elevation or must be appropriately protected from the probable maximum flood. (BSC 2004g Section 6.1.2.1 and BSC 2005b Section 4.3.2)

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
DTF (continued)	Structure (continued)	ITS	SC	• The structure shall be designed such that storm water runoff from the maximum observed hourly precipitation event (with a 100-year return period) does not enter the structure. (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2) • The roof of the structure shall be designed for the loads associated with a volcanic ash fall. (BSC 2004b Section 6.4.53) • Flooding of areas of the structure where moderators are controlled shall be precluded by passive design features such as drains, flood control channels, curbs, elevated processing areas, and walls. (BSC 2005b Section 5.1.1.21) • The DTF structure shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the DTF structure has sufficient seismic design margin to ensure that a "no structural collapse" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The exterior walls of the DTF shall not be penetrated or collapsed by an F-16 aircraft crashing into an exterior wall at the speed corresponding to the 95th percentile from a probability distribution estimated from historical F-16 crashes. (BSC 2005d Section 5.1.5) • Surfaces in the load paths through which WPs, standardized DOE SNF canisters, DOE MCOs, naval SNF canisters, DPCs, transportation casks, horizontal transfer casks, or site-specific casks are transferred by crane shall be kept free of structures, such as post and curbs, that could puncture a container in the event of a drop. (BSC 2005b Section 5.1.1.40) • The severity of potential fires shall not jeopardize the structural integrity of structures where SNF/HLW is present. (BSC 2004c Section 5.1.3.2) • Portions, parts, subparts, or subsystems of a non-ITS SSC, which upon failure could adversely interact with an ITS SSC and prevent its safety function from being performed, shall be classified as ITS or redesigned to eliminate the potential unacceptable interaction with the identified ITS SSC. For seismic interactions, portions, parts, subparts, or subsystems of an otherwise non-ITS SSC shall be classified as ITS and shall be designed to the same seismic DBGM as the ITS SSCs subjected to the potential unacceptable interaction, or the non-ITS SSC may be redesigned to eliminate the potential unacceptable interaction. (BSC 2005b Section 5.1.1.37)

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
DTF (continued)	Remediation Pool	ITS	SC	• The remediation pool structure shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the remediation pool structure has sufficient seismic design margin to ensure that a “no failure” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The pool and pool area in the remediation system shall ensure that any lost water can be replaced with make-up water until the cause of the loss is corrected or waste forms are removed from the pool. The minimum available rate of make-up water shall be sufficient to replenish evaporation and the maximum potential leakage in the event of the failure of the recirculating cooling system over the minimum time period required to remove waste forms from the pool. The rate shall also be sufficient to prevent the uncovering of the waste forms over this same period. (BSC 2005b Section 5.1.2.5)
	Rail Systems for Trolleys, WP Transporters, and SRTCs	ITS	SC	• The rails and rail anchorages within the structure shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, it shall be demonstrated that the rails and rail anchorages have sufficient seismic design margin to ensure that a “no derailment” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Permanent Shielding (including shield doors, shield view ports, and viewing windows)	ITS	SC	• The DTF permanent shielding (including shield doors, shield view ports, and viewing windows) shall be designed for loading conditions associated with a DBGM-1 seismic event to demonstrate sufficient seismic design margin to ensure that a “shielding integrity remains intact” safety function[3] is maintained. (BSC 2004a Table IV-1) • Closure of airlock doors, shield doors, or other applicable doors on a trolley, SRTC, site-specific cask transporter, WP transporter, other conveyance, or transportation cask or site-specific cask suspended from an overhead crane shall not cause a tipover of the conveyance or cause the conveyance or crane to drop its load. (BSC 2005b Section 5.1.1.13) • Radiation exposure to workers due to inadvertent actuation of doors shall be precluded such that this is not a Category 1 event. (BSC 2005b Section 5.1.1.57)
Fuel Handling Facility				
FHF	Structure	ITS	SC	• The structure shall: (1) be designed for the loads associated with a design basis extreme wind speed. (BSC 2004g Section 6.1.1.2 and BSC 2004d Section 9)

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
FHF (continued)	Structure (continued)	ITS	SC	• The structure shall (continued): (2) be designed for the loads associated with a design basis tornado maximum wind speed with a corresponding pressure drop and rate of pressure drop. (BSC 2004g Section 4.2.2.3.7 and BSC 2004d Section 9) (3) not allow the penetration of Spectrum II tornado missiles, except for the entrance and exit vestibules and the steel structures on the FHF roof. (BSC 2004d Sections 6.4.4.1.1 and 9) • The roof of the structure shall be designed for the loads associated with the maximum observed hourly precipitation event (with a 100-year return period). (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2) • Facilities that could be damaged by flooding shall be located above the probable maximum flood elevation or must be appropriately protected from the probable maximum flood. (BSC 2004g Section 6.1.2.1 and BSC 2005b Section 4.3.2) • The structure shall be designed such that storm water runoff from the maximum observed hourly precipitation event (with a 100-year return period) does not enter the structure. (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2) • The roof of the structure shall be designed for the loads associated with a volcanic ash fall. (BSC 2004b Section 6.4.53) • Flooding of areas of the structure where moderators are controlled shall be precluded by passive design features such as drains, flood control channels, curbs, elevated processing areas, and walls. (BSC 2005b Section 5.1.1.21) • The FHF structure shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the FHF structure has sufficient design margin to ensure that a “no structural collapse” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The exterior walls of the FHF shall not be penetrated or collapsed by an F-16 aircraft crashing into an exterior wall at the speed corresponding to the 95th percentile from a probability distribution estimated from historical F-16 crashes. (BSC 2005d Section 5.1.5) • Surfaces in the load paths through which WPs, standardized DOE SNF canisters, naval SNF canisters, DPCs, transportation casks, or site-specific casks are transferred by crane shall be kept free of structures, such as post and curbs, that could puncture a container in the event of a drop. (BSC 2005b Section 5.1.1.40) • The severity of potential fires shall not jeopardize the structural integrity of structures where SNF/HLW is present. (BSC 2004c Section 5.1.3.2)

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
FHF (continued)	Structure (continued)	ITS	SC	• Portions, parts, subparts, or subsystems of a non-ITS SSC, which upon failure could adversely interact with an ITS SSC and prevent its safety function from being performed, shall be classified as ITS or redesigned to eliminate the potential unacceptable interaction with the identified ITS SSC. For seismic interactions, portions, parts, subparts, or subsystems of an otherwise non-ITS SSC shall be classified as ITS and shall be designed to the same seismic DBGM as the ITS SSCs subjected to the potential unacceptable interaction, or the non-ITS SSC may be redesigned to eliminate the potential unacceptable interaction. (BSC 2005b Section 5.1.1.37)
	Rail Systems for Trolleys and the WP Transporter	ITS	SC	• The rails and rail anchorages within the structure shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, it shall be demonstrated that the rails and rail anchorages have sufficient seismic design margin to ensure that a “no derailment” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Permanent Shielding (including shield doors, shield view ports, and viewing windows)	ITS	SC	• Closure of airlock doors, shield doors, or other applicable doors on a trolley, SRTC, WP transporter, or other conveyance, or a site-specific cask suspended from the vestibule gantry crane, shall not cause a tipover of the conveyance or cause the conveyance or crane to drop its load. (BSC 2005b Section 5.1.1.13) • The FHF permanent shielding (including shield doors, shield view ports, and viewing windows) shall be designed for loading conditions associated with a DBGM-1 seismic event to demonstrate sufficient seismic design margin to ensure that a “shielding integrity remains intact” safety function[3] is maintained. (BSC 2004a Table IV-1) • Radiation exposure to workers due to inadvertent actuation of doors shall be precluded such that this is not a Category 1 event. (BSC 2005b Section 5.1.1.57)
Subsurface Facility				
Subsurface Facility	Rails	N/A	Non-SC	Not Applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Subsurface Facility (continued)	Size and Layout of Drifts	ITS ITWI	SC	• The design of the subsurface facility shall ensure that the size and layout of the emplacement drifts are consistent with the drift and rockfall modeling, including the evaluation of the characteristics of the credible bounding rockfalls. (BSC 2005b Section 6.3.6.1.20) • Portions, parts, subparts, or subsystems of a non-ITS SSC, which upon failure could adversely interact with an ITS SSC and prevent its safety function from being performed, shall be classified as ITS or redesigned to eliminate the potential unacceptable interaction with the identified ITS SSC. For seismic interactions, portions, parts, subparts, or subsystems of an otherwise non-ITS SSC shall be classified as ITS and shall be designed to the same seismic DBGM as the ITS SSCs subjected to the potential unacceptable interaction, or the non-ITS SSC may be redesigned to eliminate the potential unacceptable interaction. (BSC 2005b Section 5.1.1.37)
	Nonemplacement Openings	ITS	SC	• The design shall ensure size and layout of nonemplacement openings are consistent with drift and rockfall modeling. (BSC 2005b Section 6.3.6.1.20) • The ramp, portals, shafts, and shaft collar areas shall be protected from water inflow as a result of the probable maximum flood. (BSC 2005b Section 4.3.2) • Portions, parts, subparts, or subsystems of a non-ITS SSC, which upon failure could adversely interact with an ITS SSC and prevent its safety function from being performed, shall be classified as ITS or redesigned to eliminate the potential unacceptable interaction with the identified ITS SSC. For seismic interactions, portions, parts, subparts, or subsystems of an otherwise non-ITS SSC shall be classified as ITS and shall be designed to the same seismic DBGM as the ITS SSCs subjected to the potential unacceptable interaction, or the non-ITS SSC may be redesigned to eliminate the potential unacceptable interaction. (BSC 2005b Section 5.1.1.37)
	Ground Support for Nonemplacement Openings	N/A	Non-SC	Not Applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of a preclosure event sequence.
Subsurface Facility Emplacement Drift	Emplacement Drift Excavated Opening	ITS ITWI	SC	• The design shall ensure size and layout of emplacement drifts are consistent with drift and rockfall modeling. (BSC 2005b Section 6.3.6.1.20)

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Subsurface Facility Emplacement Drift (continued)	Emplacement Drift Ground Support	N/A	Non-SC	Not Applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of a preclosure event sequence.
	Drift Invert (Steel)	N/A	Non-SC	Not Applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of a preclosure event sequence.
	Drift Invert (Ballast)	ITWI	SC	None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of a preclosure event sequence.
	WP Emplacement Pallet	ITS ITWI	SC	• The WP emplacement pallet shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no failure" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Drip Shield	ITWI	SC	None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of a preclosure event sequence.
	Drip Shield Emplacement Gantry	N/A	Non-SC	Not Applicable. None of the functions associated with this SSC are credited for the prevention or mitigation of a preclosure event sequence.
Subsurface Facility Postemplacement	Thermal Management	N/A	Non-SC	Not Applicable. None of the functions associated with this SSC are credited for the prevention or mitigation of a preclosure event sequence.
	Decommissioning and Decontamination	N/A	Non-SC	Not Applicable. None of the functions associated with this SSC are credited for the prevention or mitigation of a preclosure event sequence.
	Closure (includes keyways and backfill in access mains and exhaust mains; ventilation shafts and raises, and borehole seals)	ITWI	SC	None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of a preclosure event sequence.
	Performance Confirmation	N/A	Non-SC	Not Applicable. None of the functions associated with this SSC are credited for the prevention or mitigation of a preclosure event sequence.

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Subsurface Facility Subsurface Development	Excavation	N/A	Non-SC	Not Applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of a preclosure event sequence.
Transportation Cask Receipt/Return Facility				
Cask Receipt and Return Area	Structure	ITS	SC	• The load carrying members of the structure shall: (1) be designed for the loads associated with a design basis extreme wind speed. (BSC 2004g Section 6.1.1.2 and BSC 2004d Section 9) (2) be designed for the loads associated with a design basis tornado maximum wind speed with a corresponding pressure drop and rate of pressure drop. (BSC 2004g Section 4.2.2.3.7 and BSC 2004d Section 9) (3) not allow the penetration of Spectrum II tornado missiles, except for the entrance and exit vestibules. (BSC 2004d Section 9) • The roof of the structure shall be designed for the loads associated with the maximum observed hourly precipitation event (with a 100-year return period). (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2) • Facilities that could be damaged by flooding shall be located above the probable maximum flood elevation or must be appropriately protected from the probable maximum flood. (BSC 2004g Section 6.1.2.1 and BSC 2005b Section 4.3.2) • The structure shall be designed such that storm water runoff from the maximum observed hourly precipitation event (with a 100-year return period) does not enter the structure. (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2) • The roof of the structure shall be designed for the loads associated with a volcanic ash fall. (BSC 2004b Section 6.4.53) • The TCRRF load-carrying members shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the TCRRF load carrying members have sufficient seismic design margin to ensure that a "no structural collapse" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The severity of potential fires shall not jeopardize the structural integrity of structures where SNF/HLW is present. (BSC 2004c Section 5.1.3.2)

Table A-I. Nuclear Safety Design Bases of Facilities

Facility, System, or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Receipt and Return Area (continued)	Structure (continued)	ITS	SC	• Portions, parts, subparts, or subsystems of a non-ITS SSC, which upon failure could adversely interact with an ITS SSC and prevent its safety function from being performed, shall be classified as ITS or redesigned to eliminate the potential unacceptable interaction with the identified ITS SSC. For seismic interactions, portions, parts, subparts, or subsystems of an otherwise non-ITS SSC shall be classified as ITS and shall be designed to the same seismic DBGM as the ITS SSCs subjected to the potential unacceptable interaction, or the non-ITS SSC may be redesigned to eliminate the potential unacceptable interaction. (BSC 2005b Section 5.1.1.37)
Transportation Cask Buffer Area	Structure	N/A	Non-SC	Not Applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.
Warehouse & Non-Nuclear Receipt Facility				
WNNRF	Structure	N/A	Non-SC	Not Applicable. No function of this facility is credited for the prevention or mitigation of an event sequence.

NOTES: BDBGM = beyond design basis ground motion; CHF = Canister Handling Facility; DBGM = design basis ground motion; DTF = Dry Transfer Facility; FHF = Fuel Handling Facility; ITS = important to safety; SC = safety category; SRTC = site rail transfer cart; SSC = structure, system, or component; SSCs = structures, systems, and components; TCRRF = Transportation Cask Receipt and Return Facility; WNNRF = Warehouse and Non-Nuclear Receipt Facility.

INTENTIONALLY LEFT BLANK

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask/MSC/WP Preparation System				
Cask Preparation	Cask Handling Crane (CHF); 200 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the casks handled by this crane are provided in Table C-1 in Appendix C, including the following: 1. Transportation casks without impact limiters containing naval SNF canisters. 2. Transportation casks without impact limiters containing standardized DOE SNF canisters. 3. Transportation casks without impact limiters containing DOE HLW canisters and commercial SNF in vertical DPCs. 4. Transportation casks without impact limiters containing a DOE MCO. 5. Site specific casks with vertical DPCs. • This crane and its rigging shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no drop" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a transportation cask or site-specific cask. (BSC 2005b Section 5.1.1.19)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Preparation (continued)	Cask Handling Crane (CHF); 200 ton (continued)	ITS	SC	• This crane shall not be capable of exerting sufficient force during transfer to breach a cask as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Cask Handling Crane (DTF); 200 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the casks handled by this crane are provided in Table C-1 in Appendix C; these casks include: 1. Transportation casks without impact limiters containing standardized DOE SNF canisters, DOE HLW canisters, commercial SNF, or vertical or horizontal DPCs. 2. Site-specific casks containing commercial SNF or vertical or horizontal DPCs. 3. Transportation casks without impact limiters containing a DOE MCO. • This crane and its rigging shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Preparation (continued)	Cask Handling Crane (DTF); 200 ton (continued)	ITS	SC	• This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a transportation cask or site-specific cask. (BSC 2005b Section 5.1.1.19) • This crane shall not be capable of exerting sufficient force during transfer to breach a cask as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Naval Cask Handling Crane (DTF); 200 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limit for transportation casks without impact limiters containing a naval SNF canister is provided in Table C-1 in Appendix C. • This crane and its rigging shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Preparation (continued)	Naval Cask Handling Crane (DTF); 200 ton (continued)	ITS	SC	• This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a naval SNF transportation cask. (BSC 2005b Section 5.1.1.19) • This crane shall not be capable of exerting sufficient force during transfer to breach a naval SNF transportation cask as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Crane Lifting Yokes	ITS	SC	• Crane lifting yokes shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no drop" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Turntables (DTF)	ITS	SC	• Turntables shall be designed for stability and prevention of a tipover of any waste container on the table for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the turntable has sufficient seismic design margin to ensure that a "no tipover" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • In the event of a credible fire in an area where waste forms are present, the temperature of machinery that handles or transports SNF/HLW shall not reach a level that would cause a drop of a cask while on a turntable. (BSC 2004c Section 5.1.3.1) • A tipover and breach of a cask while on a turntable that handles SNF/HLW due to uncontrolled movements produced by a loss of power or a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Preparation (continued)	Cask Docking Rings (DTF, FHF)	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	Cask Pit, Pedestal; (CHF)	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	Cask Pit Protective Cover (CHF)	ITS	SC	• The cask pit protective cover shall be designed for loading conditions associated with a DBGM-1 seismic event and demonstrate sufficient seismic design margin to a "shielding integrity remains intact" safety function[3]. (BSC 2004a Table IV-1) • The cask pit protective cover shall be sturdy enough to prevent a WP or site-specific cask that is dropped on the pit cover from penetrating the pit cover and falling into the pit. (BSC 2005b Section 5.1.6.6) • Radiation exposure to workers due to inadvertent actuation of the pit protective covers shall be precluded such that this is not a Category 1 event. (BSC 2005b Section 5.1.1.57)
	Pit Crush Pads (CHF)	ITS	SC	• Crush pads shall limit the impact energy of a dropped canister, cask, or WP to be less than or equal to the impact energy associated with a drop of a canister, cask, or WP onto an unyielding surface from their maximum specified drop height for the canister, cask, or WP[6]. (BSC 2005b Section 5.1.1.18)
	Vestibule Gantry Crane (FHF); 200 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Preparation (continued)	Vestibule Gantry Crane (FHF); 200 ton (continued)	ITS	SC	• The lift height limits for the transportation casks handled by this crane are provided in Table C-1 in Appendix C; these casks include: 1. Transportation cask without impact limiters containing naval SNF canisters. 2. Transportation cask without impact limiters containing standardized DOE SNF canisters or DOE HLW canisters. 3. Transportation cask without impact limiters or site-specific cask containing commercial SNF or DPCs. • This crane and its rigging shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no drop" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a transportation cask or site-specific cask. (BSC 2005b Section 5.1.1.19) • This crane shall not be capable of exerting sufficient force during transfer to breach a cask, WP, or site-specific cask as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Main Transfer Room Crane (FHF); 200 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • The probability of dropping handling equipment from a crane onto a canister shall be less than or equal to 1×10^{-5} for each canister transferred. (BSC 2005b Section 5.1.1.11)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Preparation (continued)	Main Transfer Room Crane (FHF); 200 ton (continued)	ITS	SC	• Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the transportation casks, canisters, and WPs handled by this crane are provided in Table C-1 in Appendix C; these casks, canisters, and WPs include: 1. Transportation casks without impact limiters, including casks containing naval SNF canisters, DOE HLW canisters, standardized DOE SNF canisters, vertical DPCs, or commercial SNF. 2. Site-specific casks containing commercial SNF or vertical DPCs. 3. Naval SNF canisters. 4. DOE HLW canisters, standardized DOE SNF canisters, and vertical DPCs. 5. Unsealed, loaded WPs. 6. Sealed WPs. 7. Sealed WPs in a horizontal orientation on an emplacement pallet. • This crane and its rigging shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a loaded sealed site-specific cask, a loaded sealed WP, a DOE HLW canister, a standardized DOE SNF canister, a naval SNF canister, or a DPC. (BSC 2005b Section 5.1.1.19) • This crane shall not be capable of exerting sufficient force to breach a cask, WP, canister, or site-specific cask during transfer as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Preparation (continued)	Mobile Elevating Platform	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	Pit Movable Platforms (CHF)	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	Cask Trolleys, Pedestals, and Hold-Down Devices (DTF, FHF)	ITS	SC	• Upon a loss of power, this trolley shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this trolley shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.2) • The trolley system shall be designed for loading conditions associated with a DBGM-2 seismic event to maintain trolley stability and prevent waste container slapdown. In addition, an analysis shall demonstrate that the trolley system has sufficient seismic design margin to ensure that a "no slapdown" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • Pedestals and hold-down devices shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no tipover" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The trolley shall be designed with an inherent speed limit such that a collision at the trolley speed limit would not cause the trolley to drop its load. (BSC 2005b Section 5.1.1.61) • Loaded transfer trolleys shall not derail or drop their loads. (BSC 2005b Section 5.1.1.36) • In the event of a credible fire in an area where waste forms are present, the temperature of the machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A tipover and breach of a cask while on machinery that transports SNF/HLW due to uncontrolled movements produced by a loss of power or a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Preparation	WP Trolleys, Pedestals, and Hold-Down Devices (DTF, CHF, FHF)	ITS	SC	• Upon a loss of power, this trolley shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this trolley shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.2) • WP trolleys shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no tipover" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • Pedestals and hold-down devices shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no slapdown" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The trolley shall be designed with an inherent speed limit such that a collision at the trolley speed limit would not cause the trolley to drop its load. (BSC 2005b Section 5.1.1.61) • Loaded transfer trolleys shall not derail or drop their loads. (BSC 2005b Section 5.1.1.36) • In the event of a credible fire in an area where waste forms are present, the temperature of the machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A tipover and breach of a cask while on machinery that transports SNF/HLW due to uncontrolled movements produced by a loss of power or a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	WP Docking Ring (DTF, FHF)	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Preparation (continued)	WP and Canister Handling Crane (CHF); 100 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • The probability of dropping handling equipment from a crane onto a canister shall be less than or equal to 1×10^{-5} for each canister transferred. (BSC 2005b Section 5.1.1.11) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the canisters and WPs handled by this crane are provided in Table C-1 in Appendix C; these canisters and WPs include: 1. Naval SNF canisters, standardized DOE SNF canisters, DOE MCOs, or DOE HLW canisters. 2. Vertical DPCs. 3. Unsealed WPs containing standardized DOE SNF canisters, DOE HLW canisters, naval SNF canisters, or DOE MCOs. 4. Sealed WPs containing standardized DOE SNF canisters, DOE HLW canisters, naval SNF canisters, or DOE MCOs. 5. Sealed WPs in a horizontal orientation on an emplacement pallet. • This crane and its rigging shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a loaded sealed WP, a standardized DOE SNF canister, a DOE HLW canister, a naval SNF canister, a DOE MCO, a loaded sealed site-specific cask, or a DPC. (BSC 2005b Section 5.1.1.19) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Preparation (continued)	WP and Canister Handling Crane (CHF); 100 ton (continued)	ITS	SC	• This crane shall not be capable of exerting sufficient force during transfer to breach a canister or WP as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1)
	Crane Lifting Yokes	ITS	SC	• Crane lifting yokes shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	WP/MSC Pit Protective Covers (CHF)	ITS	SC	• The WP/MSC pit protective covers shall be designed for loading conditions associated with a DBGM-1 seismic event and demonstrate sufficient seismic design margin to a “no failure” safety function[3]. (BSC 2004a Table IV-1) • Pit covers shall be sturdy enough to prevent a WP or site-specific cask that is dropped on the pit cover from penetrating the pit cover and falling into the pit. (BSC 2005b Section 5.1.6.6) • Radiation exposure to workers due to inadvertent actuation of the pit protective covers shall be precluded such that this is not a Category 1 event. (BSC 2005b Section 5.1.1.57)
	WP/MSC Pit Pedestals (CHF)	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	Crush Pad	ITS	SC	• Crush pads shall limit the impact energy of a dropped unsealed WP to be less than or equal to the impact energy associated with a drop of an unsealed WP onto an unyielding surface from the maximum specified drop height for the unsealed WP[6]. (BSC 2005b Section 5.1.1.50)
Cask Restoration	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Receipt and Return System				
SRTC Buffer	SRTC	ITS	SC	• In the instances when the SRTC moves a cask without impact limiters (typically only within structures), the SRTC shall prevent slapdown of the cask for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the SRTC transporting a cask without impact limiters has sufficient seismic design margin to ensure that a "no slapdown" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • A speed limit for which SRTCs will be pulled/pushed by the SRTC tractor shall be established such that a collision with shield or airlock doors or other heavy objects does not overturn the SRTC or cause it to lose its load. (BSC 2005b Section 5.1.1.38) • In the instances where the SRTC moves a cask without impact limiters (typically only within structures) an SRTC carrying a transportation cask or a site-specific cask shall not derail and the transportation cask or site-specific cask shall not fall from the SRTC under normal operating conditions or as the result of a collision. (BSC 2005b Section 5.1.1.35)
	SRTC Rails	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	SRTC Positioner	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	SRTC Positioner Turntable	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	SRTC Tractor	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Receipt and Return	Cask Handling Crane (TCRRF); 250 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the transportation casks handled by this crane are provided in Table C-1 in Appendix C; these casks include: 1. Transportation casks without impact limiters. 2. Transportation casks with impact limiters. • This crane and its rigging shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a transportation cask. (BSC 2005b Section 5.1.1.19) • This crane shall not be capable of exerting sufficient force to breach a cask during transfer as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Receipt and Return (continued)	Crane Lifting Yokes	ITS	SC	• The crane lifting yokes shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic margin to ensure that a "no drop" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Crush Pad	ITS	SC	• Crush pads shall limit the impact energy of a dropped cask to be less than or equal to the impact energy associated with a drop of a cask onto an unyielding surface from the maximum specified drop height for the cask[6]. (BSC 2005b Section 5.1.1.18)
Communications System				
Communications	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Digital Control and Management Information System				
Digital Control and Management Information	Entire	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
DOE and Commercial WP System				
DOE and Commercial WP	Entire	ITS ITWI	SC	• Sealed WPs shall withstand without breaching the following drops: (BSC 2005b Section 5.1.3.12) A. Free-drop of 6.5 ft from a vertical orientation onto a horizontal surface (trunnion collars installed) B. Free-drop of 7.8 ft from a horizontal orientation onto a horizontal surface (trunnion collars installed) C. Free-drop with the emplacement pallet from a horizontal orientation onto a horizontal surface (trunnion collars not installed) of 6.5 ft from the bottom of the emplacement pallet

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
DOE and Commercial WP (continued)	Entire (continued)	ITS ITWI	SC	• Sealed WPs shall withstand without breaching the following drops (continued): (BSC 2005b Section 5.1.3.12) D. Tip-over onto a horizontal surface from a 6.5 ft elevated surface (trunnion collars installed) E. Tip-over onto the tilting machine, including contact with the trunnion cradles or the floor (trunnion collars installed). Note: Drop and tip-over event sequences shall be evaluated for worst possible (most damaging) credible conditions including initial geometric position and weight of contents. An unyielding, flat horizontal surface may be used to bound the consequences of a drop. Drops shall include attendant swing-down and/or slap-down from the indicated position, with or without trunnion collars attached, as appropriate. • WPs, in a horizontal orientation on an emplacement pallet, shall be lifted in accordance with the lift height limits in Table C-1 in Appendix C. • WPs in a vertical orientation shall be lifted in accordance with the lift height limits in Table C-1 in Appendix C. • WPs shall withstand a single rockfall of 1.2×10^5 joules or less without breaching. (BSC 2005b Section 6.3.6.1.20) • WPs shall withstand two consecutive rockfalls having a total kinetic energy of 1.0×10^5 joules or less without breaching. (BSC 2005b Section 6.3.6.1.20) • WPs shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that “no breach” and “no criticality” safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The size of the berth in a WP shall be restricted such that a DOE MCO cannot be tilted more than an angle of 3 degrees from vertical upon impact with the floor of the berth. (BSC 2005b Section 5.1.1.15) • In the event of a credible fire, the wall temperature of a loaded but unsealed WP with only the inner lid installed (welded or not) shall not exceed its allowable operating range[2, 5]. (BSC 2004c Section 5.1.2.10)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
DOE and Commercial WP (continued)	Entire (continued)	ITS ITWI	SC	• In the event of a credible fire, the wall temperature of a sealed WP shall not exceed its allowable operating range[5]. (BSC 2004c Section 5.1.2.11) • In the event of a credible fire, the wall temperature of an open, loaded WP with a docking ring installed shall not exceed its allowable operating range[2, 5]. (BSC 2004c Section 5.1.2.17) • A WP shall not breach as a result of the credible fire[5]. • Sealed WPs shall be designed such that drops, collisions, and other handling impacts within the WP design bases (allowing for rearrangement of container internals and without credit for burnup) cannot lead to a nuclear criticality. (BSC 2005b Section 5.1.3.1) • WPs shall be designed, with credit for moderator control, such that: (BSC 2005b Section 5.1.3.2) A. WPs configured for commercial SNF can be loaded with any combination of commercial SNF assemblies that are acceptable for disposal without leading to a preclosure nuclear criticality. B. DOE codisposal WPs can be loaded with any combination of DOE canisters that fit in the basket positions without leading to a preclosure nuclear criticality. The demonstration of criticality safety must account for the bowing of fuel rods or other rearrangement of fissile material that may occur due to a drop or other handling incident. • A WP that is dropped from within 2 ft above an essentially unyielding flat surface shall not spill its contents. (BSC 2005b Section 5.1.3.11)
	Trunnion Collar	ITS	SC	• Trunnion collars shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
DOE SNF Disposable Canister				
DOE SNF Disposable Canister	Standardized DOE SNF Canister	ITS	SC	• The probability that a standardized DOE SNF canister is defective such that it may breach if dropped in any orientation from a height of 23 ft onto an essentially unyielding flat surface shall be 2.3×10^{-4} or less. (BSC 2005b Section 4.2.2) • A standardized DOE SNF canister in a cask, WP, staging rack, or staging pit, shall withstand without breach a drop of a DOE HLW canister onto it from 2 ft above the floor of the transfer cell and from 23 ft above the floor of the cask, WP, staging rack, or staging pit. (BSC 2005b Section 5.1.1.25) • A standardized DOE SNF canister shall not breach if lifted in accordance with the lift height limits in Table C-1 in Appendix C. • A standardized DOE SNF canister shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic margin to ensure that "no breach" and "no criticality" safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • A standardized DOE SNF canister shall withstand without breach a drop of another standardized DOE SNF canister drop on top of it from 23 ft above the floor of a cask, WP, staging rack or staging pit and from 2 ft above the floor of the transfer cell. (BSC 2005b Section 5.1.1.28) • A drop of a standardized DOE SNF canister shall not lead to a nuclear criticality assuming that the canister is not breached and moderator control is in effect. (BSC 2005b Section 5.1.1.3) • In the event of a credible fire, the wall temperature of a DOE standardized canister shall not exceed its allowable operating range. The operating temperature of a standardized DOE SNF canister, when it is not inside another canister, is 149 °C (300 F), and 316 °C (600 °F), after placement into another canister. Containment can be maintained for temperatures as high as 343 °C (650 °F)[5]. (BSC 2004c Section 5.1.2.5) • A standardized DOE SNF canister shall not breach as a result of the credible fire[5].

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
DOE SNF Disposable Canister (continued)	DOE MCO	ITS	SC	• The probability that a DOE MCO is defective such that it may breach if dropped from less than a height of 23 ft in less than a 3-degree vertical orientation or 2 ft from any orientation shall be 2.3×10^{-4} or less. (BSC 2005b Section 4.2.2) • A DOE MCO in a cask or WP shall withstand without breach a drop of a DOE HLW canister onto it from 2 ft above the floor of the transfer cell and from 23 ft above the floor of the cask or WP. (BSC 2005b Section 5.1.1.25) • A DOE MCO shall withstand without breach a drop of another DOE MCO onto it from 2 ft above the floor of the transfer cell and from 23 ft above the floor of the cask or WP. (BSC 2005b Section 5.1.1.28) • A DOE MCO shall not breach if dropped in accordance with the lift height limits in Table C-1 in Appendix C. • A DOE MCO shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that “no breach” and “no criticality” safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • A drop of a DOE MCO shall not lead to a nuclear criticality assuming that the canister is not breached and moderator control is in effect. (BSC 2005b Section 5.1.1.3) • In the event of a credible fire, the wall temperature of a DOE MCO shall not exceed its allowable operating range. The most restrictive temperature is the handling temperature, 132 °C[5]. (BSC 2004c Section 5.1.2.6) • A DOE MCO shall not breach as a result of the credible fire[5].
	DOE HLW Canister	ITS	SC	• A DOE HLW canister shall be designed for loading conditions associated with a DBGM-1 seismic event and to demonstrate sufficient seismic design margin to a “no breach” safety function[3]. (BSC 2004a Table IV-1) • A DOE HLW canister shall not be subjected to a temperature exceeding its allowable operating range; the temperature limit of the waste form inside the canister is 400°C[5]. (BSC 2004c Section 5.1.2.7)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
DOE SNF Disposable Canister (continued)	Internal Geometry Control	ITS	SC	• The DOE SNF disposable canister internal geometry control shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no criticality" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Internal Neutron Absorbers	ITWI	SC	• No function of this SSC is credited for the prevention or mitigation of a preclosure event sequence.
Dual Purpose Canister				
DPC	Entire	ITS	SC	• In the event of a credible fire, the wall temperature of a loaded DPC, being handled or at rest, shall not exceed its allowable operating range[5]. (BSC 2004c Section 5.1.2.9) • A DPC shall not breach as a result of the credible fire[5]. • DPCs shall be designed to ensure nuclear criticality safety with optimum moderation and the most reactive waste forms. Criticality safety will be maintained despite any geometric rearrangements due to a drop or other handling incident. (BSC 2005b Section 5.1.1.4)
Electrical Power System				
Switchyard	Line End Transmission Tower; Line Side High Voltage Disconnect Switch; High Voltage Breaker (continued on next page)	ITS	SC	• Electrical power system components shall provide reliable power to the DTF and FHF Surface Nuclear HVAC Primary Confinement Subsystem to meet the performance criteria in accordance with the Surface Nuclear HVAC Primary Confinement Subsystem nuclear safety design bases. (BSC 2005b Section 5.1.1.48, BSC 2004f Table 9)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Switchyard (continued)	(continued) Load Side High Voltage Disconnect Switch; Main Transformer; and Nonsegmented Bus to 12.17 kV Main Switchgear	ITS	SC	• Electrical power system components shall provide reliable power to the DTF and FHF Surface Nuclear HVAC Primary Confinement Subsystem to meet the performance criteria in accordance with the Surface Nuclear HVAC Primary Confinement Subsystem nuclear safety design bases. (BSC 2005b Section 5.1.1.48, BSC 2004f Table 9)
Normal Power	12.47 kV Main Switchgear; 12.47 kV to 4.16 kV Distribution Transformer to Emergency Switchgear Bus A; 12.47 kV to 4.16 kV Distribution Transformer to Emergency Switchgear Bus B	ITS	SC	• Electrical power system components shall provide reliable power to the DTF and FHF Surface Nuclear HVAC Primary Confinement Subsystem to meet the performance criteria in accordance with the Surface Nuclear HVAC Primary Confinement Subsystem nuclear safety design bases. (BSC 2005b Section 5.1.1.48; BSC 2004f Table 9)
	4.16 kV Switchgear Bus A, B, C, and D; 12.47 kV Switchgear C and D (located at South Portal), Standby Diesel Generators	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Emergency Power	4.16 kV Emergency Switchgear Bus A and B; Emergency Load Center Transformers for DTF1, DTF2, and FHF; Emergency Load Centers and MCC located in DTF 1, DTF2, and FHF; and Feeders up to and including the ITS Loads	ITS	SC	• Electrical power system components shall provide reliable power to the DTF and FHF Surface Nuclear HVAC Primary Confinement Subsystem to meet the performance criteria in accordance with the Surface Nuclear HVAC Primary Confinement Subsystem nuclear safety design bases. (BSC 2005b Section 5.1.1.48, BSC 2004f Table 9)
	Emergency Diesel Generators A and B	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.
Electrical Support System				
Lighting	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.
Grounding	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.
Lightning Protection	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.
Cathodic Protection	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Heat Tracing	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.
Cable Raceway	The Portion of Cable Raceway Subsystem that Supports ITS Functions of the Electrical Power System (including the switchyard, 12.47 kV main switchgear A and B, 4.16 kV emergency bus A and B, 480 V emergency load centers and MCCs, 125 V DC and 120 V AC UPS	ITS	SC	• The portion of the cable raceway subsystem that supports ITS functions of the emergency power subsystem shall provide reliable power to the DTF and FHF Surface Nuclear HVAC Primary Confinement System to meet the performance criteria in accordance with the Surface Nuclear HVAC Primary Confinement System nuclear safety design bases. (BSC 2005b Section 5.1.1.48)
	The Portion of Cable Raceway Subsystem that Supports Non-SC Functions of the Electrical Power System (including portions of the normal power subsystem, standby power subsystem, and emergency diesel generators)	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Emplacement and Retrieval System				
WP Transportation	WP Transporter	ITS	SC	• The WP transporter shall transport the WP in a manner such that if a collision or derailment (excluding tipover) occurs, the WP impact energy will be low enough to preclude a WP breach; this impact energy translates into a maximum WP transporter speed of 15 mph. (BSC 2005b Section 5.1.7.3) • The WP transporter shall transport the WP in a manner such that if a collision or derailment leading to a WP transporter tipover occurs, the WP impact energy will be low enough to preclude a WP breach. (BSC 2005b Section 5.1.7.7) • While on the surface, the WP transporter shall be designed to function in extreme straight wind (90 mph). (BSC 2005b Section 4.1.13) • The WP transporter and its bedplate shall not collide with a WP on the WP turntable and cause a WP breach. (BSC 2005b Section 5.1.1.39) • The rate of a WP transporter runaway shall be less than 8.3×10^{-9} runaways per trip. (BSC 2005b Section 6.3.6.1.4) • The WP transporter (together with the locomotive and coupler) shall be designed to prevent runaway of the WP transporter for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the WP transporter (together with the locomotive and coupler) has sufficient seismic design margin to ensure that a "no runaway" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Transportation (continued)	WP Transporter (continued)	ITS	SC	• The WP transporter shall be designed for loading conditions associated with a DBGM-1 seismic event and demonstrate sufficient seismic design margin to a “shielding integrity remains intact” safety function[3]. (BSC 2004a Table IV-1) • The transporter shielded compartment shall withstand any fall of failed ground support materials, as well as a set of rockfalls having a total mass of 5.4 MT, without jeopardizing the structural integrity of the WP. (BSC 2005b Section 6.3.6.1.9) • Movement of the WP transporter shielded enclosure doors shall not breach the WP or cause it to fall from the bedplate of the transporter. (BSC 2005b Section 5.1.7.2) • The restraints used to immobilize the bedplate inside the shielded compartment of the WP transporter and the mechanism for locking the doors of the shielded compartment shall withstand a collision or derailment (including tipover) of the transporter without resulting in a Category 1 or Category 2 event sequence. (BSC 2005b Section 5.1.7.4) • Spurious or operator-induced opening of the WP shielded compartment followed by a bedplate roll-out shall be precluded when the transporter is in motion. (BSC 2005b Section 5.1.7.6) • Radiation exposure to workers due to inadvertent actuation of the WP transporter shielded compartment doors shall be precluded such that this is not a Category 1 event. (BSC 2005b Section 5.1.1.57) • Upon a loss of power, the WP transporter shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, the WP transporter shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.2)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Emplacement	WP Emplacement Gantry	ITS	SC	• The emplacement gantry shall have a drop rate of less than or equal to 1×10^{-5} drops/transfer regardless of the cause, including equipment failures, human error, or some combination of the two. (BSC 2005b Section 5.1.8.1) • The lift height limit for WPs in a horizontal orientation on the emplacement pallet is provided in Table C-1 in Appendix C. • The WP emplacement gantry, carrying a WP, shall not be capable of running off the end of the emplacement drift or transfer dock rails. (BSC 2005b Section 5.1.8.3) • If the WP emplacement gantry were to fall on the WP transporter and impact the WP, it shall not cause the WP to be breached. (BSC 2005b Section 5.1.8.6) • The WP emplacement gantry shall be limited to a maximum speed of 15 mph such that a collision at this speed limit shall not result in a WP breach. (BSC 2005b Section 5.1.8.7) • Upon a loss of power, the WP emplacement gantry shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, the WP emplacement gantry shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.2) • The conditional probability of the WP emplacement gantry having exceeded the lift height limit given that a drop occurred shall be 10^{-4} or less. (BSC 2005b Section 5.1.8.10) • In the event of a credible fire in an area where waste forms are present, the temperature of machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A tipover and breach of a WP due to uncontrolled movements produced by a loss of power or a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
WP Retrieval	Components of this System are the same as those in the WP Transportation and WP Emplacement Subsystems	ITS	SC	The nuclear safety design bases for this system are the same as those in the WP Transportation and WP Emplacement Subsystems since they share the same components.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Support Equipment	Transport Locomotive	ITS	SC	• The transport locomotive (together with the WP transporter and coupler) shall be designed to prevent the runaway of the WP transporter for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the transport locomotive (together with the WP transporter and coupler) has sufficient seismic design margin to ensure that a "no runaway" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • In the event of a credible fire in an area where waste forms are present, the temperature of machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1)
	Gantry Carrier	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
Environmental/Meteorological Monitoring System				
Environmental/ Meteorological Monitoring	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with this subsystem are credited for the prevention or mitigation of an event sequence.
Fire Protection System				
Fire Protection	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
HVAC Plant Heating and Cooling System				
HVAC Plant Heating and Cooling	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Low-Level Radiological Waste Management System				
Low-Level Radiological Waste Management	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Low-Level Radiological Waste Generating Systems				
Low-Level Radiological Waste Generating	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Naval Spent Nuclear Fuel Canister				
Naval SNF Canister Internals	Naval SNF Canister Baskets, Loading Sleeves and Cans; Control Rods or Neutron-Absorbing Material, Attachment Hardware; SNF Cladding	ITWI	SC	This SSC is ITWI; no function of this SSC is credited for the prevention or mitigation of an event sequence.
Naval SNF Canister	Naval SNF Canister	ITS ITWI	SC	• The naval SNF canister shall not breach as a result of the credible fire[5, 7]. • The naval SNF canister shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no breach" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Naval Spent Nuclear Fuel Waste Package System				
Naval SNF WP	Entire	ITS ITWI	SC	• Sealed naval SNF WPs shall withstand without breaching the following drops: (BSC 2005b Section 5.1.3.12) A. Free-drop of 6.5 ft (3.3 ft for the naval long SNF WP) from a vertical orientation onto a horizontal surface (trunnion collars installed) B. Free-drop of 7.8 ft from a horizontal orientation onto a horizontal surface (trunnion collars installed) C. Free-drop with the emplacement pallet from a horizontal orientation onto a horizontal surface (trunnion collars not installed) of 6.5 ft from the bottom of the emplacement pallet D. Tip-over onto a horizontal surface from a 6.5 ft (1.6 ft for the naval long SNF WP) elevated surface (trunnion collars installed) E. Tip-over onto the tilting machine, including contact with the trunnion cradles or the floor (trunnion collars installed). Note: Drop and tip-over event sequences shall be evaluated for worst possible (most damaging) credible conditions including initial geometric position and weight of contents. An unyielding, flat horizontal surface may be used to bound the consequences of a drop. Drops shall include attendant swing-down and/or slap-down from the indicated position, with or without trunnion collars attached, as appropriate. • A naval SNF WP in a horizontal orientation on the emplacement pallet shall be lifted in accordance with the lift height limits in Table C-1 in Appendix C. • A naval long SNF WP in a vertical orientation shall be lifted in accordance with the lift height limits in Table C-1 in Appendix C. • Naval SNF WPs shall withstand a single rockfall of 1.2×10^5 joules or less without breaching. (BSC 2005b Section 6.3.6.1.20)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Naval SNF WP (continued)	Entire (continued)	ITS ITWI	SC	• Naval SNF WPs shall withstand two consecutive rockfalls having a total kinetic energy of 1.0×10^5 joules or less without breaching. (BSC 2005b Section 6.3.6.1.20) • Naval SNF WPs shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient margin to ensure that “no breach” and “no criticality” safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • Sealed naval SNF WPs shall be designed such that drops, collisions, and other handling impacts within the WP design bases (allowing for rearrangement of container internals and without credit for burnup) cannot lead to a nuclear criticality. (BSC 2005b Section 5.1.3.1) • The naval SNF WP shall be designed such that it can be loaded with a naval SNF canister without leading to a preclosure nuclear criticality with credit for moderator control. (BSC 2005b Section 5.1.3.2) • A naval SNF WP that is dropped from within 2 ft above an essentially unyielding flat surface shall not spill its contents. (BSC 2005b Section 5.1.3.11) • An unsealed naval SNF WP containing a naval SNF canister shall be lifted in accordance with the lift height limits in Table C-1 in Appendix C. • In the event of a credible fire, the wall temperature of a loaded but unsealed naval SNF WP with only the inner lid installed (welded or not) shall not exceed its allowable operating range[2, 5]. (BSC 2004c Section 5.1.2.10) • In the event of a credible fire, the wall temperature of a sealed naval SNF WP shall not exceed its allowable operating range[5]. (BSC 2004c Section 5.1.2.11) • In the event of a credible fire, the wall temperature of an open, loaded naval SNF WP with a docking ring installed shall not exceed its allowable operating range[2, 5]. (BSC 2004c Section 5.1.2.17) • A naval SNF WP shall not breach as a result of the credible fire[5].
	Trunnion Collar	ITS	SC	• Trunnion collars shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Non-Nuclear Handling System				
Non-Nuclear Handling	Entire	N/A	Non-SC	Not applicable. None the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Non-Radiological Waste Management System				
Non-Radiological Waste Management	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Plant Services System				
Plant Services	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Radiation/Radiological Monitoring System				
Radiation/ Radiological Monitoring	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Remediation System				
Dry Remediation	Trolley, Pedestal, and Hold-Down Device	ITS	SC	• Upon a loss of power, this trolley shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this trolley shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.2)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Dry Remediation (continued)	Trolley, Pedestal, and Hold-Down Device (continued)	ITS	SC	• Pedestals and hold-down devices shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no tipover" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The trolley system shall be designed for loading conditions associated with a DBGM-2 seismic event to maintain trolley stability and prevent waste container slapdown. In addition, an analysis shall demonstrate that the trolley system has sufficient seismic design margin to ensure that a "no slapdown" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The trolley shall be designed with an inherent speed limit such that a collision at the trolley speed limit would not cause the trolley to drop its load. (BSC 2005b Section 5.1.1.61) • Loaded transfer trolleys shall not derail or drop their loads. (BSC 2005b Section 5.1.1.36) • In the event of a credible fire in an area where waste forms are present, the temperature of the machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A tipover and breach of a cask while on machinery that handles or transports SNF/HLW due to uncontrolled movements produced by a loss of power or a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Turntable	ITS	SC	• The turntable system shall be designed for loading conditions associated with a DBGM-2 seismic event to maintain turntable stability and prevent waste container tipover. In addition, an analysis shall demonstrate that the turntable system has sufficient seismic design margin to ensure that a "no tipover" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Dry Remediation (continued)	Turntable (continued)	ITS	SC	• In the event of a credible fire in an area where waste forms are present, the temperature of machinery that handles or transports SNF/HLW shall not reach a level that would cause a drop of a cask or a WP while on the turntable. (BSC 2004c Section 5.1.3.1) • A tipover and breach of a cask while on a turntable that handles SNF/HLW due to uncontrolled movements produced by a loss of power or a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Docking Station	ITS	SC	• A drop or collision involving components associated with a docking port shall not breach the lid of a transportation cask or site-specific cask situated at the docking port. (BSC 2005b Section 5.1.1.17)
Wet Remediation	Cask Handling Crane; 200 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limit for transportation casks without impact limiters or site-specific casks is provided in Table C-1 of Appendix C. • This crane and its rigging shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no drop" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a transportation cask or site-specific cask. (BSC 2005b Section 5.1.1.19)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Wet Remediation (continued)	Cask Handling Crane; 200 ton (continued)	ITS	SC	• This crane shall not be capable of exerting sufficient force during transfer to breach a cask as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Pit Crush Pad	ITS	SC	• Crush pads shall limit the impact energy of a dropped canister, cask, or WP to be less than or equal to the impact energy associated with a drop of a cask or WP onto an unyielding surface from their maximum specified drop height for the cask or WP[6]. (BSC 2005b Section 5.1.1.18)
	Pool Crush Pad	ITS	SC	• The remediation pool shall be designed with the appropriate impact-absorbing capability to prevent loss of pool integrity given a drop of the most challenging transportation cask or site-specific cask into the pool. (BSC 2005b Section 5.1.2.6)
	Turntable	N/A	Non-SC	Not applicable. No function of this SSC is credited for the prevention or mitigation of an event sequence.
	Fuel Handling Machine and Grapples	ITS	SC	• The fuel handling machine and grapples shall be designed for loading conditions associated with a DBGM-1 seismic event and demonstrate sufficient seismic design margin to a "maintain waste form" safety function[3]. (BSC 2004a Table IV-1) • The fuel handling machine and grapples shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no fall down" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The fuel handling machine shall have a drop rate of less than or equal to 1×10^{-5} drops/transfer, including transfers in single-assembly canisters. (BSC 2005b Section 5.1.1.7)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Wet Remediation (continued)	Fuel Handling Machine and Grapples (continued)	ITS I	SC	• The rate of collisions during an assembly transfer operation shall be less than or equal to 1×10^{-5} collisions/transfer. (BSC 2005b Section 5.1.1.8) • The probability of a drop of handling equipment onto a commercial SNF assembly with enough energy to breach the assembly shall be less than or equal to 1×10^{-7} impacts/transfer for each assembly transferred. (BSC 2005b Section 5.1.1.9) • The fuel handling machine shall not be capable of lateral movements of handling equipment at a speed that could initiate an event sequence as a result of a collision with an SNF assembly. (BSC 2005b Section 5.1.1.54) • Upon a loss of power, the fuel handling machine shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • In the event of a credible fire in an area where waste forms are present, the temperature of the machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from machinery that handles SNF due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Crane Lifting Yokes and Grapples	ITS	SC	• The crane lifting yokes and grapples shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the crane lifting yokes and grapples have sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Staging Racks/Baskets in Remediation Pool	ITS	SC	• The staging racks shall be designed for loading conditions associated with a DBGM-2 seismic event for stability and distortion such as to maintain assembly geometry in the rack. In addition, analyses shall demonstrate that the staging racks have sufficient seismic design margin to ensure that distortion of the racks is limited and stability is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Wet Remediation (continued)	Staging Racks/Baskets in Remediation Pool (continued)	ITS	SC	• Fully loaded baskets in staging racks shall be subcritical when fully flooded with pure water (i.e., no credit for neutron absorbers dissolved in the water); the baskets shall have sufficient criticality controls to remain subcritical under the expected range of conditions resulting from handling incidents in and out of staging racks; and the baskets shall be closed during handling such that a closed basket being transferred in the pool will not spill SNF assemblies into the pool if the basket is dropped. (BSC 2005b Section 5.1.5.9)
WP Remediation	WP Remediation Crane; 100 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • The probability of dropping handling equipment from a crane onto a canister shall be less than or equal to 1×10^{-5} for each canister transferred. (BSC 2005b Section 5.1.1.11) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the WPs and canisters handled by this crane are provided in Table C-1 in Appendix C; these WPs and canisters include: 1. Sealed WPs containing commercial SNF, standardized DOE canisters, DOE HLW canisters, naval SNF canisters, or DOE MCOs. 2. Unsealed, loaded WPs containing commercial SNF, standardized DOE canisters, DOE HLW canisters, naval SNF canisters, or DOE MCOs. 3. Standardized DOE SNF canisters, DOE HLW canisters, DOE MCOs, sealed vertical DPCs, or unsealed vertical DPCs. • This crane system shall be designed for loading conditions associated with a DBGM-2 seismic event and maintain its load. In addition, an analysis shall demonstrate that this crane system has sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Remediation (continued)	WP Remediation Crane;100 ton (continued)	ITS	SC	• This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a loaded sealed WP, a DOE MCO, a standardized DOE SNF canister, a DOE HLW canister, or a DPC. (BSC 2005b Section 5.1.1.19) • This crane shall not be capable of exerting sufficient force to breach a WP or a canister as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • This crane, which can be used to transfer SNF assemblies, shall not be capable of lateral movements of handling equipment at a speed that could initiate an event sequence as a result of a collision with an SNF assembly. (BSC 2005b Section 5.1.1.54) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Crane Lifting Yokes	ITS	SC	• Crane lifting yokes shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no drop" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	WP/DPC Trolley, Pedestal, and Hold-Down Devices	ITS	SC	• Upon a loss of power, this trolley shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this trolley shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.2) • The trolley system shall be designed for loading conditions associated with a DBGM-2 seismic event to maintain trolley stability and prevent waste container slapdown. In addition, an analysis shall demonstrate that the trolley system has sufficient seismic design margin to ensure that a "no slapdown" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Remediation (continued)	WP/DPC Trolley, Pedestal, and Hold-Down Devices (continued)	ITS	SC	• Pedestals and hold-down devices shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that a "no tipover" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The trolley shall be designed with an inherent speed limit such that a collision at the trolley speed limit would not cause the trolley to drop its load. (BSC 2005b Section 5.1.1.61) • Loaded transfer trolleys shall not derail or drop their loads. (BSC 2005b Section 5.1.1.36) • In the event of a credible fire in an area where waste forms are present, the temperature of the machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A tipover and breach of a cask while on machinery that transports SNF/HLW due to uncontrolled movements produced by a loss of power or a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
Safeguards and Security System				
Safeguards and Security	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
SNF Aging				
Cask Transfer	Cask Tractor	ITS	SC	• The design of the horizontal cask transfer trailer tractor shall limit the potential damage caused by collisions. (Cogema 2004 No. S.23 Table 6-6) • Loss of power events shall be precluded. (Cogema 2004 No. S.4 Table 6-6) • Tip-over during transfer shall be precluded by ensuring that minimum tip-over resistance/standards are maintained consistent with roadway design. (Cogema 2004 No. S.25 Table 6-6)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Transfer (continued)	Cask Tractor (continued)	ITS	SC	• The design of the horizontal cask transfer trailer tractor shall provide reliable means to stop and maintain stability. (Cogema 2004 No. S.26 Table 6-6) • The cask tractor system shall be designed to prevent runaway of the tractor under loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the cask tractor system has sufficient seismic design margin to ensure that a "no runaway" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Horizontal Cask Transfer Trailer	ITS	SC	• The design of the hydraulic ram shall ensure that it cannot fail or be operated in a manner that can cause a DPC loss of function through excess force or ram over-travel. (Cogema 2004 No. S.28 Table 6-6) • The horizontal cask transfer trailer system shall be designed for stability and to retain the waste container and prevent a runaway for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the horizontal cask transfer trailer has sufficient seismic design margin to ensure that "no slapdown" and "no runaway" safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The design of the horizontal cask transfer trailer shall limit the maximum potential drop height. (Cogema 2004 No. S.22 Table 6-6) • The design of the horizontal cask transfer trailer/tractor shall limit potential damage to a loaded SNF cask caused by collisions. (Cogema 2004 No. S.23 Table 6-6) • The design of the horizontal cask transfer trailer shall preclude tip-over during transfer by ensuring that the transfer equipment design precludes failure modes that could result in tip-over under design basis load handling conditions and by ensuring that minimum tip-over resistance/stability standards are maintained consistent with roadway design. (Cogema 2004 Nos. S.24 and S. 25Table 6-6)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Transfer (continued)	Site-Specific Cask Transporter	ITS	SC	• The site-specific cask transporter system shall be designed for stability and to retain the waste container and prevent a runaway for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the site-specific cask transporter system has sufficient seismic design margin to ensure that "no slapdown" and "no runaway" safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • A speed limit for the site-specific cask transporter shall be established such that a collision with shield or airlock doors or other heavy objects does not overturn the site-specific cask transporter or cause it to drop its load. (BSC 2005b Section 5.1.1.38) • The cask transporter shall prevent the lifting of aging and transfer casks above their maximum handling height. (BSC 2005b Section 4.1.11) • The design of the site-specific cask transporter shall limit the maximum potential drop height. (Cogema 2004 No. S.22 Table 6-6) • The design of the site-specific cask transporter shall limit potential damage to a loaded SNF cask caused by collisions. (Cogema 2004 No. S.23 Table 6-6) • The design of the site-specific cask transporter shall preclude tip-over during transfer by ensuring that the transfer equipment design precludes failure modes that could result in tip-over under design basis load handling conditions and by ensuring that minimum tip-over resistance/stability standards are maintained consistent with roadway design. (Cogema 2004 Nos. S.24 and 25 Table 6-6) • The design of the site-specific cask transporter shall provide reliable means to stop and maintain stability. (Cogema 2004 No. S.26 Table 6-6) • Loss of power events shall be precluded. (Cogema 2004 No. S.4 Table 6-6) • Upon a loss of power, this transporter shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this transporter shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.2)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Cask Transfer (continued)	Site-Specific Transfer Cask	ITS	SC	• The design of the site-specific transfer casks shall ensure that they can withstand a drop from the maximum handling height of a horizontal cask transfer trailer without loss of function. (Cogema 2004 No. S.12 Table 6-6) • The design of the site-specific transfer casks shall ensure that they can withstand a drop of heavy objects handled during transfer operations; e.g., access cover plate, from the maximum handling height without adverse effects. (Cogema 2004 No. S.14 Table 6-6)
Aging Pad	Surface Aging Pad	ITS	SC	• The aging pad shall be designed to preclude inundation during the maximum probable flood. (Cogema 2004 No. S.20 Table 6-6) • The aging pad shall be located to avoid placement directly over Quaternary faults with a potential for significant displacement. (Cogema 2004 No. S.21 Table 6-6) • The surface aging pad system shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the surface aging pad system has sufficient seismic design margin to ensure that a “no significant cracking/displacement” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The structure shall be designed for the loads associated with the maximum observed hourly precipitation event (with a 100-year return period). (BSC 2004g Section 6.1.1.1.2 and BSC 2005b Section 4.3.2)
	Support Structures (including Utility Buildings and Personnel Barriers)	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
	Aircraft Protection Barrier that Surrounds the Aging Pads	ITS	SC	• A barrier, to be at least as tall as the aging casks and to be located in proximity to the fence line of the aging pads, shall be provided surrounding the aging pads such that the barrier would not be breached by an F-16 aircraft crashing into the barrier at the speed corresponding to the 95th percentile from a probability distribution estimated from historical F-16 crashes. (BSC 2005d Section 5.1.6)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Aging Cask	Site-Specific Cask	ITS	SC	• The site-specific cask system and other vertical aging/staging systems employed shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the site-specific cask system and other vertical aging/staging systems employed have sufficient seismic design margin to ensure that “no tipover” and “no breach” safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • Tip-over of aging casks and modules as a result of extreme wind or tornado events shall be precluded. (Cogema 2004 No. S.5 Table 6-6) • The design of aging casks and modules shall ensure that they can withstand the differential pressure associated with a passing tornado without loss of function. (Cogema 2004 No. S.7 Table 6-6) • Tip-over of aging casks and modules as a result of being struck by a design basis tornado missile shall be precluded. (Cogema 2004 No. S.8 Table 6-6) • The design of aging casks and modules shall ensure that they can withstand being struck by a design basis tornado missile without loss of function. (Cogema 2004 No. S.9 Table 6-6) • The design of the site-specific casks shall ensure that they can withstand a drop from the maximum handling height of a site-specific cask transporter without loss of function. (Cogema 2004 No. S.12 Table 6-6) • The design of the casks and modules shall ensure acceptable thermal design performance during extreme temperature events. (BSC 2004g Section 6.1.1.1.2 and Cogema 2004 No. S.15 Table 6-6) • Short-duration vent blockage events involving casks and modules shall be precluded. (Cogema 2004 No. S.16 Table 6-6) • The casks and modules shall not lose their intended function under conditions involving the maximum snow, sand, or ash loads. (Cogema 2004 No. S.17 Table 6-6) • The design of the casks and modules shall ensure that welded closure casks/canister confinement system designs preclude loss of confinement following closure of the casks to meet life cycle operations. (Cogema 2004 No. S.18 Table 6-6) • The design of the site-specific cask shall ensure that the bolted closure cask design protects seals from damage following closure to maintain its primary confinement boundary function to meet life cycle operations. (Cogema 2004 No. S.19 Table 6-6)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Aging Cask (continued)	Site-Specific Cask (continued)	ITS	SC	• Site-specific casks shall be designed to ensure nuclear criticality safety with optimum moderation and the most reactive waste forms. Criticality safety will be maintained despite any geometric rearrangements due to a drop or other handling incident. (BSC 2005b Section 5.1.1.4) • In the event of a credible fire, the wall temperature of a loaded site-specific cask, being handled or at rest, shall not exceed its allowable operating range[5]. (BSC 2004c Section 5.1.2.4) • In the event of a credible fire, the wall temperature of a loaded site-specific cask with docking ring installed shall not exceed its allowable operating range[2, 5]. (BSC 2004c Section 5.1.2.15) • A site-specific cask shall not breach as a result of the credible fire[5]. • The design of the horizontal DPC shall ensure that it has sufficient structural design margin to withstand maximum ram force events. (Cogema 2004 No. S.27 Table 6-6)
	Horizontal Aging Module	ITS	SC	• HAMs shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the HAMs have sufficient seismic design margin to ensure that a “no collapse” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • Tip-over of aging casks and modules as a result of extreme wind or tornado events shall be precluded. (Cogema 2004 No. S.5 Table 6-6) • The design of aging casks and modules shall ensure that they can withstand the differential pressure associated with a passing tornado without loss of function. (Cogema 2004 No. S.7 Table 6-6) • Tip-over of aging casks and modules as a result of being struck by a design basis tornado missile shall be precluded. (Cogema 2004 No. S.8 Table 6-6) • The design of aging casks and modules shall ensure that they can withstand being struck by a design basis tornado missile without loss of function. (Cogema 2004 No. S.9 Table 6-6) • The design of the casks and modules shall ensure acceptable thermal design performance during extreme temperature events. (BSC 2004g Section 6.1.1.1.2 and Cogema 2004 No. S.15 Table 6-6)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Aging Cask (continued)	Horizontal Aging Module (continued)	ITS	SC	• Short-duration vent blockage events involving casks and modules shall be precluded. (Cogema 2004 No. S.16 Table 6-6) • The casks and modules shall not lose their intended function under conditions involving the maximum snow, sand, or ash loads. (Cogema 2004 No. S.17 Table 6-6) • The design of the casks and modules shall ensure that welded closure casks/canister confinement system designs preclude loss of confinement following closure of the casks to meet life cycle operations. (Cogema 2004 No. S.18 Table 6-6)
SNF/HLW Transfer System				
WP Loadout	WP Handling Crane (DTF, Room 1044); 100 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the sealed and unsealed, loaded WPs handled by this crane are provided in Table C-1 in Appendix C. These WPs include: 1. Unsealed, loaded WPs containing commercial SNF, standardized DOE SNF canisters, DOE HLW canisters, naval SNF canisters, or DOE MCOs. 2. Sealed WPs containing commercial SNF, standardized DOE SNF canisters, DOE HLW canisters, naval SNF canisters, or DOE MCOs. • This crane system shall be designed for loading conditions associated with a DBGM-2 seismic event and maintain its load. In addition, an analysis shall demonstrate that this crane system has sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Loadout (continued)	WP Handling Crane (DTF, Room 1044); 100 ton (continued)	ITS	SC	• This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a loaded, sealed WP. (BSC 2005b Section 5.1.1.19) • This crane shall not be capable of exerting sufficient force to breach a WP as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	WP Loadout Handling Crane (DTF Room 1088); 100 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • This crane system shall be designed for loading conditions associated with a DBGM-2 seismic event and maintain its load. In addition, an analysis shall demonstrate that the crane system has sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The lift height limits for the sealed WPs handled by this crane are provided in Table C-1 in Appendix C. These WPs include sealed WPs containing commercial SNF, standardized DOE SNF canisters, DOE HLW canisters, naval SNF canisters, or DOE MCOs. • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a loaded, sealed WP. (BSC 2005b Section 5.1.1.19)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Loadout (continued)	WP Loadout Handling Crane (DTF Room 1088); 100 ton (continued)	ITS	SC	• This crane shall not be capable of exerting sufficient force to breach a WP as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Crane Lifting Yokes	ITS	SC	• Crane lifting yokes shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the crane lifting yokes have sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Trolley, Pedestal, and Hold-Down Devices (DTF)	ITS	SC	• Upon a loss of power, this trolley shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this trolley shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.2) • The trolley system shall be designed for loading conditions associated with a DBGM-2 seismic event to maintain trolley stability and prevent waste container slapdown. In addition, an analysis shall demonstrate that the trolley system has sufficient seismic design margin to ensure that a “no slapdown” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The trolley shall be designed with an inherent speed limit such that a collision at the trolley speed limit would not cause the trolley to drop its load. (BSC 2005b Section 5.1.1.61)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Loadout (continued)	Trolley, Pedestal, and Hold-Down Devices (DTF) (continued)	ITS	SC	• Pedestals and hold-down devices shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the pedestals and hold-down devices have sufficient seismic design margin to ensure that a “no tipover” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • Loaded transfer trolleys shall not derail or drop their loads. (BSC 2005b Section 5.1.1.36) • In the event of a credible fire in an area where waste forms are present, the temperature of the machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1) • A tipover and breach of a cask while on machinery that transports SNF/HLW due to uncontrolled movements produced by a loss of power or a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	WP Tilting Machine (DTF, CHF, FHF)	ITS	SC	• The WP tilting machine system shall be designed for loading conditions associated with a DBGM-2 seismic event to maintain stability and prevent a WP drop or slapdown. In addition, an analysis shall demonstrate that the WP tilting machine system has sufficient seismic design margin to ensure that “no drop” and “no slapdown” safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The WP tilting machine shall be designed to prevent backward slapdowns. (BSC 2005b Section 5.1.1.53) • The WP tilting machine shall include measures to prevent movement or release of the lock on WP trunnions while the WP is being lowered onto the emplacement pallet. (BSC 2005b Section 5.1.1.53) • An impact or collision between the WP tilting machine and a WP shall not breach the WP or cause it to fall off the emplacement pallet. (BSC 2005b Section 5.1.3.10)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
WP Loadout (continued)	WP Turntable (DTF, CHF, FHF)	ITS	SC	• The WP turntable system shall be designed for loading conditions associated with a DBGM-2 seismic event to maintain turntable stability and prevent WP tipover. In addition, an analysis shall demonstrate that the WP turntable system has sufficient seismic design margin to ensure that a "no tipover" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The premature actuation of the WP turntable (while holding the WP on an emplacement pallet) before the disengagement of the trunnion collar removal machine shall be precluded. (BSC 2005b Section 5.1.1.16) • An impact or collision between the WP turntable and a WP shall not breach the WP or cause it to fall off the emplacement pallet. (BSC 2005b Section 5.1.3.10)
	Trunnion Collar Removal Machine (DTF, CHF, FHF)	ITS	SC	• The trunnion collar removal machine system shall be designed for loading conditions associated with a DBGM-2 seismic event to prevent slapdown of the WP. In addition, an analysis shall demonstrate that the trunnion collar removal machine system has sufficient seismic design margin to ensure that "no slapdown" and "no breach" safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The premature actuation of the WP turntable (while holding the WP on an emplacement pallet) before the disengagement of the trunnion collar removal machine shall be precluded. (BSC 2005b Section 5.1.1.16) • An impact or collision between the trunnion collar removal machine and a WP shall not breach the WP or cause it to fall off the emplacement pallet. (BSC 2005b Section 5.1.3.10)
DPC Cutting	DPC Cutting Machine (DTF)	ITS	SC	• The design of the DPC cutting machine shall ensure that the DPC lid will prevent damage to the SNF assembly resulting in radiological release should the cutting machine fall into or make contact with the DPC. (BSC 2005b Section 5.1.5.3) • The DPC cutting machine shall preclude a radiological release due to damage inflicted upon the DPC contents during the cutting process. (BSC 2005b Section 5.1.5.4) • The DPC cutting machine shall be designed for loading conditions associated with a DBGM-2 seismic event and to demonstrate sufficient seismic design margin to ensure that "no failure" and "no fall down" safety functions[3] are maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
DPC Cutting (continued)	DPC Docking Station	ITS	SC	• A drop or collision involving components associated with a docking port shall not breach the lid of a transportation cask or site-specific cask situated at the docking port. (BSC 2005b Section 5.1.1.17)
Dry Transfer	Spent Fuel Transfer Machine and Grapples (DTF, FHF)	ITS	SC	• Upon a loss of power, the spent fuel transfer machine shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this machine shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The spent fuel transfer machine shall have a drop rate of less than or equal to 1×10^{-5} drops/transfer, including transfers in single-assembly canisters. (BSC 2005b Section 5.1.1.7) • The spent fuel transfer machine and grapples shall be designed for loading conditions associated with a DBGM-1 seismic event to demonstrate sufficient seismic design margin to ensure that a “maintain waste form” safety function[3] is maintained. (BSC 2004a Table IV-1) • The rate of collisions during an assembly transfer operation shall be less than or equal to 1×10^{-5} collisions/transfer. (BSC 2005b Section 5.1.1.8) • The probability of a drop of handling equipment onto a commercial SNF assembly with enough energy to breach the assembly shall be less than or equal to 1×10^{-7} impacts/transfer for each assembly transferred. (BSC 2005b Section 5.1.1.9) • The spent fuel transfer machine and anchorages shall be designed to prevent collapse of this system for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the spent fuel transfer machine and anchorages have sufficient seismic design margin to ensure that a “no fall down” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • The spent fuel transfer machine shall not be capable of lateral movements of handling equipment at a speed that could initiate an event sequence as a result of a collision with an SNF assembly. (BSC 2005b Section 5.1.1.54) • In the event of a credible fire in an area where waste forms are present, the temperature of machinery that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Dry Transfer (continued)	Spent Fuel Transfer Machine and Grapples (DTF, FHF) (continued)	ITS	SC	• A drop of a load from machinery that handles SNF due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1)
	Canister/HLW Handling Crane (DTF); 70 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • The probability of dropping handling equipment from a crane onto a canister shall be less than or equal to 1×10^{-5} for each canister transferred. (BSC 2005b Section 5.1.1.11) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the canisters handled by this crane (including the DOE MCO, standardized DOE SNF canister, and DOE HLW canister) are provided in Table C-1 in Appendix C. • The crane system shall be designed for loading conditions associated with a DBGM-2 seismic event and maintain its load. In addition, an analysis shall demonstrate that the crane system has sufficient seismic design margin to ensure that a "no drop" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a standardized DOE SNF canister, a DOE HLW canister, or a DOE MCO. (BSC 2005b Section 5.1.1.19) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Dry Transfer (continued)	Canister/HLW Handling Crane (DTF); 70 ton (continued)	ITS	SC	• A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1) • This crane shall not be capable of exerting sufficient force to breach a canister as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20)
	Navy Canister Handling Crane (DTF); 70 ton	ITS	SC	• The drop rate for cranes involved in handling waste forms and their associated containers shall be less than or equal to 1×10^{-5} drops/transfer, regardless of cause, including human error, failure of equipment such as yokes and grapples, or a combination of the two. (BSC 2005b Section 5.1.1.10) • Upon a loss of power, this crane shall be designed to stop, retain its load, and enter a locked mode; upon a restoration of power, this crane shall stay in the locked mode until operator action is taken. (BSC 2005b Section 5.1.2.1) • The conditional probability of the crane exceeding a lift-height limit, given that a drop has occurred, shall be less than or equal to 1×10^{-4}. (BSC 2005b Section 5.1.1.12) • The lift height limits for the naval SNF canisters handled by this crane are provided in Table C-1 in Appendix C. • This crane system shall be designed for loading conditions associated with a DBGM-2 seismic event and maintain its load. In addition, an analysis shall demonstrate that this crane system has sufficient seismic design margin to ensure that a “no drop” safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1) • This crane shall not be capable of moving above a speed limit for overhead crane transfers such that a collision at the speed limit would not breach a naval SNF canister. (BSC 2005b Section 5.1.1.19) • In the event of a credible fire in an area where waste forms are present, the temperature of the crane that handles or transports SNF/HLW shall not reach a level that would make it drop its load. (BSC 2004c Section 5.1.3.1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Dry Transfer (continued)	Navy Canister Handling Crane (DTF); 70 ton (continued)	ITS	SC	• A drop of a load from a crane that handles SNF/HLW due to a spurious signal caused by a fire shall have a probability of less than 1×10^{-4} over the life of the facility. (BSC 2004c Section 5.1.3.4; BSC 2005b Section 6.1.1.1) • This crane shall not be capable of exerting sufficient force to breach a canister as the result of attempts to overcome mechanical constraints. (BSC 2005b Section 5.1.1.20)
	Crane Lifting Yokes	ITS	SC	• The crane lifting yokes shall be designed for loading conditions associated with a DBGM-2 seismic event. In addition, an analysis shall demonstrate that the crane lifting yokes have sufficient seismic design margin to ensure that a "no drop" safety function[3] is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
	Cask/WP Docking Stations (DTF, FHF)	ITS	SC	• A drop or collision involving components associated with a docking port shall not breach the lid of a transportation cask or site-specific cask situated at the docking port. (BSC 2005b Section 5.1.1.17)
	Canister and SNF Staging Racks (DTF)	ITS	SC	• Criticality safety shall be ensured for the commercial SNF assembly staging racks loaded to capacity with the most reactive commercial SNF assembly accepted at the repository with moderator control in effect. (BSC 2005b Section 5.1.4.2) • Criticality safety shall be ensured for commercial SNF assemblies dropped into or onto a commercial SNF assembly staging rack with moderator control in effect. (BSC 2005b Section 5.1.4.3) • The most reactive configuration of standardized DOE SNF canisters shall be capable of being loaded into the canister staging racks (with credit for moderator control) without leading to a nuclear criticality. (BSC 2005b Section 5.1.1.2) • The canister and SNF staging racks shall be designed for loading conditions associated with a DBGM-2 seismic event for stability and distortion such as to maintain assembly/canister geometry in the rack. In addition, analyses shall demonstrate that the staging racks have sufficient seismic design margin to ensure that distortion of the racks is limited and stability is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Dry Transfer (continued)	Canister Staging Racks (CHF)	ITS	SC	• The most reactive configuration of standardized DOE SNF canisters shall be capable of being loaded into canister staging racks (with credit for moderator control) without causing a nuclear criticality. (BSC 2005b Section 5.1.1.2) • The staging racks shall be designed for loading conditions associated with a DBGM-2 seismic event for stability and distortion such as to maintain canister geometry in the rack. In addition, analyses shall demonstrate that the staging racks have sufficient seismic design margin to ensure that distortion of the racks is limited and stability is maintained for loading conditions associated with a BDBGM seismic event. (BSC 2004a Table IV-1)
Subsurface Ventilation System				
Subsurface Ventilation	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Surface Industrial HVAC				
Surface Industrial HVAC	Inlet and Outlet Dampers and Ventilation Ducting (including stack) for Fuel Element Staging Areas (DTF Only)	ITS	SC	• The inlet and outlet dampers and ventilation ducting for the fuel element staging areas shall be designed for loading conditions associated with a DBGM-1 seismic event and demonstrate sufficient seismic design margin to a "no failure" safety function[3]. (BSC 2004a Table IV-1) • The ventilation stack for the fuel element staging areas (DTF only) shall be designed for loading conditions associated with a DBGM-1 seismic event and demonstrate sufficient seismic design margin to a "controlled failure" safety function[3]. (BSC 2004a Table IV-1) • A loss of HVAC for up to 30 days in areas where SNF or HLW is handled or staged shall not cause waste form temperatures to exceed allowable limits. (BSC 2005b Section 5.1.2.4)

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Surface Industrial HVAC (continued)	SSCs Other Than the Inlet and Outlet Dampers and Ventilation Ducting (including stack) for Fuel Element Staging Areas (DTF Only)	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Surface Nuclear HVAC				
Primary Confinement	Entire (DTF, FHF)	ITS	SC	• To mitigate the worker and public doses following a Category 1 event sequence, the Surface Nuclear HVAC system shall be equipped with HEPA filters. A two-stage HEPA filtration system with a particulate removal efficiency of at least 99% per stage is required. This requirement applies to the DTF and the FHF. (BSC 2005c Section 4.8) • The HEPA filters and vent ducts (exhaust ducting and dampers) shall be designed for loading conditions associated with a DBGM-1 seismic event and demonstrate sufficient seismic design margin to a “no discharge” safety function[3]. (BSC 2004a Table IV-1) • The probability that the HVAC system, including HEPA filtration in the primary confinement areas of the DTF and FHF, becomes unavailable during a 4-hour mission time shall be 0.01 or less, without credit for backup electrical power. (BSC 2005b Section 5.1.1.48) • The primary nuclear HEPA filtered ventilation system shall provide a decontamination factor of 10^4 for particulate. (BSC 2005c Section 4.8) • A loss of HVAC for up to 30 days in areas where SNF or HLW is handled or staged shall not cause waste form temperatures to exceed allowable limits. (BSC 2005b Section 5.1.2.4)
Secondary Confinement	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Tertiary Confinement	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Transportation Cask				
Transportation Cask	Entire	ITS	SC	Transportation casks provide adequate protection against external hazards on the repository site. See footnotes 1, 4, and 5.
WP Closure System				
Welding (Equipment)	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Inerting (Equipment)	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Non-Destructive Testing (Equipment)	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Stress Mitigation (Equipment)	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
WP Identification	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Spread Ring Installation	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Material Handling	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.

Table A-II. Nuclear Safety Design Bases of Systems and Subsystems

System or Subsystem	Component or Function	ITS or ITWI	Safety Category	Nuclear Safety Design Bases
Remote Equipment Maintenance	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.
Operations Control	Entire	N/A	Non-SC	Not applicable. None of the SSC functions associated with these subsystems are credited for the prevention or mitigation of an event sequence.

FOOTNOTES:

1. Functions of the transportation casks are credited to prevent or mitigate event sequences. The certification process for transportation casks under 10 CFR Part 71 [DIRS 104091] considers severe transportation accident conditions and conditions of normal transport. The precedent that licensed casks provide adequate protection against all hazards that apply during the transportation phase establishes the basis that the casks will continue to provide adequate protection on site at the repository.

2. This requirement may be equivalently replaced by a set of two sub-requirements. The first sub-requirement is the fire requirement applicable to the waste form being sheltered by the waste form container. The second sub-requirement is as follows: the severity of the fire should be controlled such that the waste form container does not lose its structural integrity when handled (BSC 2004c [DIRS 171488], Section 6.2.2)

3. The definitions of the Safety Functions are provided in Appendix B.

4. Transportation casks must meet the flame emissivity and cask absorptivity requirements of 10 CFR 71.73(c)(4).

5. Analyses, as appropriate, will be performed on the respective cask/canister/waste form to demonstrate that the cask, canister, and/or waste form does not fail as a result of the credible fire in all areas where it is handled.

6. Analyses will confirm that sealed WPs shall withstand drops onto energy-absorbing crush pads without breaching and that the impact consequences associated with a drop of a canister or cask onto energy-absorbing crush pads shall be equal to, or less than, the impact consequences associated with the drop of a cask or canister from the maximum specified drop height onto an unyielding surface.

7. The naval SNF canister will not be exposed to fire conditions more severe than those corresponding to a black body gas exposure flux of 50 kW/m^2 and a temperature of 1000°C (1832°F) for 2 minutes. (BSC 2004c Sections 5.1.2.8 and 6.2.1.2.6)

GENERAL NOTES:

Lift height limits can be exceeded provided that energy-absorbing material is used to limit the impact energy to that of the drop height limit.

The load drop probability includes components (lifting yokes, trunnions, and grapples) associated with the lifting and transferring of heavy loads.

The trolley system includes the trolley, rails, pedestal, and control system.

The term cask refers to both the transportation cask and the site-specific cask, unless specified otherwise.

Every facility may not use every component listed for each system.

The term breach means an opening of the cask, canister, or WP initiating a Category 1 or Category 2 event sequence.

BDBGM = beyond design basis ground motion; CHF = Canister Handling Facility; DBGM = design basis ground motion; DPC = dual-purpose canister; DOE = U.S. Department of Energy; DTF = Dry Transfer Facility; FHF = Fuel Handling Facility; HAM = horizontal aging module; HLW = high-level radioactive waste; HVAC = heating, ventilation, and air-conditioning; HEPA = high-efficiency particulate air; ITWI = important to waste isolation; MCC = motor control center; MCO = multicanister overpack; MSC = monitored geologic repository site-specific cask; SC = safety category; SNF = spent nuclear fuel; SRTC = site rail transfer cart; SSC = structure, system, or component; SSCs = structures, systems, and components; TCRRF = Transportation Cask Receipt and Return Facility; UPS = uninterruptable power supply; WNNRF = Warehouse and Non-Nuclear Receipt Facility; WP = waste package.

APPENDIX B

DEFINITION OF SAFETY FUNCTIONS

B.1 General

Each SSC that is ITS that is credited in the prevention or mitigation of a seismically initiated event sequence is assigned a safety function (or functions) with regard to performance goals for the specific SSC during and after the initiating seismic event. This appendix defines the safety functions used in this report. These definitions of safety functions were obtained from *Seismic Analysis for Preclosure Safety* (BSC 2004a [DIRS 171470], Section 4).

B.1.1 Safety Function: No Structural Collapse

The "no structural collapse" safety function is assigned to facilities and structures assigned to either a DBGM-1 or DBGM-2 level. For seismic margin calculations, the function corresponds approximately to the state of "large permanent distortion, short of collapse" of a structure or facility, termed Limit State A.

The "no structural collapse" safety function has the following performance goals during and after a seismic event:

- No structural collapse occurs (i.e., column and support members remain upright, beams remain functional, and walls remain standing), and failure of the contents is not serious enough to cause severe injury or death, prevent evacuation, or induce a breach of a waste container.

- Confinement of internal airflow is not required and may not be maintained. Concrete walls will remain standing, but may be extensively cracked; they may not maintain pressure differential with normal HVAC. Cracks will still provide a tortuous path for material release. The largest cracks are expected to be no greater than one-half in.

- Distortion of the structure will be limited, but expected to be visible to the naked eye.

- Components will remain anchored, but with no assurance that they will remain functional or easily repairable.

An additional requirement of this safety function is that the failure of adjacent structures and other SSCs (whether ITS or not) shall be considered in seismic analyses, as appropriate, and shall not induce collapse of the designated structure.

B.1.2 Safety Function: No Drop

The "no drop" safety function is assigned to cranes assigned to a DBGM-2 level. The no-drop safety function has the following performance goals during and after a seismic event:

- The crane shall not release (or drop) a waste container or waste form either due to failure of crane components or controls due to a designated seismic event.

- The crane, as a system, shall not collapse or fall down. The crane shall remain on its track or guide system (regardless if crane is holding a waste container or waste form at the time of the event).

- Horizontal movement (swinging) of the cask or WP shall be restrained (if necessary) to preclude impacts with nearby walls and barriers.

- The crane track or guide system shall remain intact and attached to the structure. It may be distorted and bent, however.

- The crane shall not move in an uncontrolled manner or exceed its design speed limit.

B.1.3 Safety Function: No Breach

The "no breach" safety function is assigned to various waste containers assigned to either a DBGM-1 or DBGM-2 level.

The no breach (leak tight) safety function has the following performance goals during and after a seismic event:

- Containment of the waste form is maintained and no release or dispersement of radionuclides (either as gas or particulates) to the environment occurs.

- Distortion and damage of the container will be limited.

B.1.4 Safety Function: No Tipover

The "no tipover" safety function is assigned to various SSCs handling casks and canisters (e.g., turntables and pedestals) assigned to either a DBGM-1 or DBGM-2 level. The no tipover safety function has the following performance goal during and after a seismic event:

- The SSC shall not allow a tipover of a cask or canister (i.e., an overturn from an upright or normal position and impact the floor, ground, or other object), or tilting of the cask or canister resulting in an impact with an adjacent SCC that is ITS causing a domino effect.

B.1.5 Safety Function: No Slapdown

The "no slapdown" safety function is assigned to various SSCs handling casks and canisters (e.g., trolleys, WP transporters, transport locomotives, horizontal aging modules, site-specific cask transporters) assigned to either a DBGM-1 or DBGM-2 level. The no slapdown safety function has the following performance goals during and after a seismic event:

- The SSC shall not allow a slapdown or rapid drop of a cask or WP in transit (i.e., the fall of a cask or WP, a vertical distance and subsequent impact onto the floor, ground, or onto another object).

- Any impacts to the cask or WP shall be within design specifications and, thereby, not induce a breach of the cask or WP in transit.

- The SSC itself may sustain substantial damage and may no longer be operable.

B.1.6 Safety Function: No Release

The "no release" safety function is assigned to staging and storage racks assigned to either a DBGM-1 or DBGM-2 level.

The no release safety function has the following performance goals during and after a seismic event:

- No release or dispersement of radionuclides (either as gas and/or as particulates) to the environment due to shaking or deformation of the waste form or storage rack.

- Distortion and damage of the waste form and rack(s) will be limited and will not preclude additional operations to retrieve the waste forms.

B.1.7 Safety Function: No Failure

The "no failure" safety function is assigned to various SSCs (e.g., limiters, collars, dampers) assigned to either a DBGM-1 or DBGM-2 level. The no failure safety function has the following performance goal during and after a seismic event:

- The SSC will continue its designated safety function after a seismic event without significant degradation in the performance or requirement for repair. For structural elements, the load response shall be essentially elastic due to the seismic event.

B.1.8 Safety Function: No Significant Cracking/Displacement

The "no significant cracking/displacement" safety function is assigned to aging pads at the DBGM-2 level. The no significant cracking/displacement safety function has the following performance goals during and after a seismic event:

- Aging pad is essentially intact. The concrete will remain structurally sound, but may contain several small cracks. The largest cracks are expected to be no greater than one-eighth in. and lengths shorter than 2 ft.

- Distortion of the pad will be very limited and not expected to be immediately apparent to the naked eye.

- Differential displacement across the pad shall be minimal, with differential displacements insufficient to cause a tipover of individual storage casks.

B.1.9 Safety Function: Controlled Failure

The "controlled failure" safety function is assigned in special instances to SSCs (e.g., ventilation stacks) to preclude potential interactions with SSCs that are ITS. The controlled failure safety function has the following performance goals for ventilation stacks during and after a seismic event:

- Failure of an SSC due to a seismic event shall not obstruct an open flow path to the environment of the corresponding ventilation system.
- Failure of an SSC shall not impede the safety function of another SSC that is ITS.

B.1.10 Safety Function: Shielding Integrity Remains Intact

The "shielding integrity remains intact" safety function is assigned to shielding SSCs (e.g., shield view ports, shield windows, shield doors) at the DBGM-1 and DBGM-2 levels. The shielding integrity remains intact safety function has the following performance goals during and after a seismic event:

- The SSC remains essentially intact and in-place, and provides sufficient (direct shine) shielding to permit workers to egress the area without receiving a significant dose ("significant" is defined as less than 10 percent of the worker dose limit).
- Cracking of glass will be limited, and drainage of fluids (used in ports and windows for shielding) will be slow.

B.1.11 Safety Function: Maintain Waste Form

The "maintain waste form" safety function is assigned to fuel handling machines at either the DBGM-1 or DBGM-2 level. The maintain waste form safety function has the following performance goals during and after a seismic event:

- The SSC continues to maintain (retain) the waste form.
- The waste form remains intact and in-place.
- Damage to the waste form is minimal.
- Significant release or dispersement of radionuclides (either as gas and/or as particulates) to the environment due to shaking or deformation of the waste form is precluded.

B.1.12 Safety Function: No Criticality

The "no criticality" safety function is assigned to various waste containers (e.g., casks, canisters, WPs) and staging and storage racks assigned to DBGM-2 level.

For various waste containers, the no criticality safety function has the following performance goals during and after a seismic event:

- The waste in the container shall remain nuclear subcritical as a result of a drop or impact within design limits with the most reactive credible configuration of the fissile material and moderation to the most reactive credible extent.

- The container internal geometry shall retain the design waste configuration with only minor damage/distortion.

For staging and storage racks, the no criticality safety function has the following performance goal during and after a seismic event:

- The rack shall remain structurally intact (with minimal distortion of the rack) and prevent bare fuel assemblies (or other exposed waste forms) to become nuclear critical as a result, considering the most reactive credible configuration of the fissile material and moderation to the most reactive credible extent.

B.1.13 Safety Function: No Runaway

The "no runaway" (uncontrolled descent) safety function is assigned to transporters and locomotives assigned to the DBGM-1 and DBGM-2 levels. The no runaway safety function has the following performance goals during and after a seismic event:

- The SSC shall stop the transport train (the trailer/car containing a waste form) after a seismic event (however, a tipover is not precluded).

- The SSC shall not allow the speed of the transport train to exceed its maximum allowable limits.

- The coupler shall remain connected between the locomotive and transport train.

B.1.14 Safety Function: No Discharge

The "no discharge" safety function is assigned to SSCs such as vent ducts, as well as HEPA filters and filter housings, which can contain a significant particulate dose and are assigned to either a DBGM-1 or DBGM-2 level.

For filters, the no discharge safety function has the following performance goals during and after a seismic event:

- No significant release or dispersement of radionuclides (particulates) to the immediate environment (to the structure interior or exterior) due to shaking of the filter and/or deformation of the filter (housing) system occurs. A significant release is defined as a release that results in less than a small fraction of the applicable dose limit over a period of 24 hours.

- No significant release or dispersement of radionuclides (particulates) back into the interior ventilation system (i.e., no back flow); this shall be precluded by valves/dampers or other appropriate devices.
- External components of the system (e.g., housings and fans) shall be rigidly anchored to major building elements (walls, floors, partitions).
- The system shall maintain its structural integrity, and distortion/damage of the housing and hangers (if applicable) will be limited.

For vent ducts, the no discharge safety function has the following performance goals during and after a seismic event:

- No significant release or dispersement of radionuclides (particulates) to the immediate environment. A significant release is defined as a release that results in less than a small fraction of the applicable dose limit over a period of 24 hours, and analyses shall consider potential accumulations within the duct re-entering the air stream.
- The duct shall maintain effective confinement of internal airflow with minimal outflow through joints.
- The duct shall maintain its structural integrity, and distortion/damage of the duct and hangers will be limited.

B.1.15 Safety Function: No Derailment

The "no derailment" safety function is assigned to trolley rails and rail tracks, which are assigned to either a DBGM-1 or DBGM-2 level.

The no derailment safety function has the following performance goals during and after a seismic event:

- No significant structural deformation of the rail occurs (i.e., the rails will not shear, heave, or warp) that is serious enough to cause a derailment or tipover of any waste transporter on the rail (e.g., WP trolley).
- No significant failure of the rail occurs (e.g., shearing, separation) that could induce a derailment if a transporter would pass over the damaged section.
- Distortion of the rail will be limited and not expected to be immediately apparent to the naked eye.

- The rail will remain, for the most part, anchored and functional (or easily repairable).

- The rail system shall not impede the braking of any waste transporter on the rail.

B.1.16 Safety Function: No Fall Down

The "no fall down" safety function is assigned to large equipment (spent fuel handling machines, welders) that could impact SSCs if the specific equipment loses its anchorage and falls due to a seismic event. These SSCs can be assigned to either a DBGM-1 or DBGM-2 level.

The no fall down safety function has the following performance goals during and after a seismic event:

- The equipment, as a system, shall not collapse or fall down. The equipment shall remain on its track/guide system (if present).

- Anchorage for the equipment shall maintain the equipment in-place.

B.1.17 Safety Function: No Loss of Confinement

The "no loss of confinement" safety function is assigned to facilities and structures assigned to either a DBGM-1 or DBGM-2 level where structural integrity and confinement after the seismic event must be credited for compliance or added for defense-in-depth. For seismic margin calculations, the function corresponds to the state of limited permanent distortion of a structure or facility, termed Limit State C.

In the present dose consequence analysis, no credit is taken for confinement for limiting offsite dose to the public and, thereby, this safety function is not used. This definition was added for completeness.

The no loss of confinement safety function has the following performance goals during and after a seismic event:

- No structural collapse occurs (i.e., column and support members remain upright, beams remain functional, and walls remain standing), and failure of contents is not serious enough to cause severe injury or death, prevent evacuation, or induce a breach of a waste container.

- Confinement of internal airflow is required and will be maintained. Concrete walls will remain standing, but may be cracked. This cracking however, is small enough to maintain the pressure differential with normal HVAC. The largest cracks are expected to be no greater than approximately one-eighth in.

- Distortion of the structure will be very limited and not expected to be immediately apparent to the naked eye.

- Components will remain anchored and functional or easily repairable.

An additional requirement of this safety function is that the failure of adjacent structures and other SSCs (whether safety-related or not) shall be considered in seismic analyses as appropriate and shall not induce collapse of the designated structure.

APPENDIX C

LIFT HEIGHT LIMITS FOR CASKS AND CANISTERS

The various casks, canisters, and WPs to be handled in the repository surface facilities shall be lifted by the various cranes in these facilities in accordance with the limits specified in Table C-1.

Table C-l. Lift Height Limits

Confinement	Contents	Lift Height Limit(s) (Note 1)	Reference
Transportation cask with impact limiters	Any waste form	30 ft in the worst orientation above an essentially unyielding flat surface	BSC 2005b Section 4.2.1
Transportation cask without impact limiters;	DOE MCO	2 ft in any orientation above an essentially unyielding flat surface unless impact absorption feature is credited	BSC 2005b Sections 5.1.1.18, 4.2.2
	Naval SNF Canister	16 ft in any orientation above an essentially unyielding flat surface	BSC 2005b Section 5.1.1.18
	Any other waste form	23 ft in any orientation above an essentially unyielding flat surface	BSC 2005b Section 5.1.1.18
Site-specific cask	Commercial SNF or DPC	23 ft in any orientation above an essentially unyielding flat surface	BSC 2005b Section 5.1.1.18
Unconfined	DPC	23 ft in vertical orientation from the floor of the transportation cask or site-specific cask and 2 ft in vertical orientation above the floor of the transfer cell	BSC 2005b Section 5.1.1.43
	Standardized DOE SNF Canister	23 ft in any orientation above an essentially unyielding flat surface and 2 ft in vertical orientation above the floor of the transfer cell	BSC 2005b Sections 5.1.1.14, 4.2.2
	DOE MCO	23 ft in vertical orientation (3 degrees or less off vertical) onto an essentially flat unyielding surface and 2 ft in any orientation above an essentially unyielding flat surface	BSC 2005b Sections 5.1.1.15, 4.2.2
	DOE HLW Canister	23 ft in vertical orientation above the floor of a cask, WP, staging rack or staging pit and 2 ft in vertical orientation above the floor of the transfer cell	BSC 2005b Section 5.1.1.24

Table C-I. Lift Height Limits (Continued)

Confinement	Contents	Lift Height Limit(s) (Note 1)	Reference
Unconfined (continued)	Naval SNF Canister	28 ft in vertical orientation above the floor of a cask or WP and 2 ft in vertical orientation above the floor of the transfer cell	BSC 2005b Section 5.1.1.42
Waste package (sealed; trunnion collars installed)	Naval Long SNF Canister	3.3 ft in vertical orientation onto an essentially unyielding flat surface and 1.6 ft for tipover from an elevated surface onto an essentially unyielding flat surface	BSC 2005b Sections 5.1.3.12 and 5.1.3.9
	Any waste form	7.8 ft in a horizontal orientation onto an essentially unyielding flat surface and 6.5 ft in a vertical orientation onto an essentially unyielding flat surface (except naval long WP) and 6.5 ft for tipover from an elevated surface onto an essentially unyielding flat surface (except naval long WP)	BSC 2005b Sections 5.1.3.12 and 5.1.3.9
Waste package (sealed; on emplacement pallet; trunnion collars not installed)	Any waste form	6.5 ft from bottom of the pallet to an essentially unyielding flat surface, in a horizontal orientation	BSC 2005b Sections 5.1.3.8 and 5.1.3.12
Waste package (unsealed)	DOE MCO	2 ft in any orientation above an essentially unyielding flat surface	BSC 2005b Sections 5.1.1.52, 4.2.2
	Naval SNF Canister	2 ft in any orientation above an essentially unyielding flat surface	BSC 2005b Sections 5.1.1.52, 5.1.1.18
	Any other waste form	23 ft in any orientation above an essentially unyielding flat surface	BSC 2005b Section 5.1.1.52

Note 1: These lift height limits can be exceeded if an appropriate impact absorption feature is credited